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ABSTRACT

These Illinois skill standards for the welding cluster are intended to serve as a guide to workforce preparation program providers as they define content for their programs and to employers as they establish the skills and standards necessary for job acquisition. They could also serve as a mechanism for communication among education, business, industry, and labor. An introduction provides a sample format, occupational earnings and employment information, and performance skill levels, a table that cross references performance skills to these occupations: production welder; fitter or fabricator welder; maintenance welder; construction or code welder; and leadman or supervisor. Each skill standard contains these components: performance area; coding that identifies the state, fiscal year in which the standard was endorsed, subcouncil abbreviation, cluster abbreviation, and standard number; conditions of performance; work to be performed; performance criteria; performance elements; and performance assessment criteria, including product and process. The 89 skill standards are categorized into these 11 areas: analysis (5 standards); setup (11); material preparation (7); shielded metal arc welding (17); gas metal arc welding (10); flux core arc welding (7); submerged arc welding (2); gas tungsten arc welding (14); surface welding (1); quality assurance and documentation (8); and automated and mechanized welding (7). (YLB)

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OCCUPATIONAL SKILL STANDARDS

WELDING CLUSTER

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ILLINOIS OCCUPATIONAL SKILL STANDARDS

WELDING CLUSTER

Endorsed for Illinois
by the
Illinois Occupational Skill Standards
and Credentialing Council

A MESSAGE FROM THE ILLINOIS OCCUPATIONAL SKILL STANDARDS AND CREDENTIALING COUNCIL

Preparing youth and adults to enter the workforce and to be able to contribute to society throughout their lives is critical to the economy of Illinois. Public and private interest in establishing national and state systems of industry-driven skill standards and credentials is growing in the United States, especially for occupations that require less than a four-year college degree. This interest stems from the understanding that the United States will increasingly compete internationally and the need to increase the skills and productivity of the front-line workforce. The major purpose of skill standards is to promote education and training investment and ensure that this education and training enables students and workers to meet industry standards that are benchmarked to our major international competitors.

The Illinois Occupational Skill Standards and Credentialing Council (IOSSCC) has been working with industry subcouncils, the Illinois State Board of Education and other partnering agencies to adopt, adapt and/or develop skill standards for high-demand occupations. Skill standards products are being developed for a myriad of industries, occupational clusters and occupations. This document represents the collaborative effort of the Manufacturing Subcouncil, and the Welding Cluster Standards Development Committee.

These skill standards will serve as a guide to workforce preparation program providers in defining content for their programs and to employers to establish the skills and standards necessary for job acquisition. These standards will also serve as a mechanism for communication among education, business, industry and labor.

We encourage you to review these standards and share your comments. This effort has involved a great many people from business, industry and labor. Comments regarding their usefulness in curriculum and assessment design, as well as your needs for in-service and technical assistance in their implementation are critical to our efforts to move forward and improve the documents.

Questions concerning this document may be directed to:

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We look forward to your comments.

Sincerely,

The Members of the IOSSCC

Margaret Blackshere

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THE ILLINOIS PERSPECTIVE

The Occupational Skill Standards Act (PA 87-1210) established the nine-member Illinois Occupational Skill Standards and Credentialing Council (IOSSCC). Members of the IOSSCC represent business, industry and labor and are appointed by the Governor or State Superintendent of Education. The IOSSCC, working with the Illinois State Board of Education, Illinois Community College Board, Illinois Board of Higher Education, Illinois Department of Employment Security and Illinois Department of Commerce and Community Affairs, has created a common vision for workforce development in Illinois.

VISION

It is the vision of the IOSSCC to add value to Illinois' education and workforce development system by developing and supporting the implementation of a statewide system of industry defined and recognized skill standards and credentials for all major skilled occupations that provide strong employment and earnings opportunities.

The IOSSCC endorses occupational skill standards and credentialing systems for occupations that

- require basic workplace skills and technical training,
- provide a large number of jobs with either moderate or high earnings, and
- provide career advancement opportunities to related occupations with moderate or high earnings.

Subcouncils and Standards Development Committees

Under the direction of the IOSSCC, and in cooperation with industry organizations and associations, industry subcouncils have been formed to review, approve and promote occupational skill standards and credentialing systems. The industry subcouncils are: Agriculture and Natural Resources; Applied Science and Engineering;* Business and Administrative Information Services; Communications; Construction;* Education and Training Services;* Energy and Utilities;* Financial Services; Health and Social Services; Hospitality; Legal and Protective Services;* Manufacturing; Marketing and Retail Trade; and Transportation, Distribution and Logistics. (*Indicates subcouncils identified for future development.)

Standards development committees are composed of business, labor and education representatives who are experts in the related occupational cluster. They work with the product developer to

- develop or validate occupational skill standards,
- identify related academic skills,
- develop or review assessment or credentialing approaches, and
- recommend endorsement of the standards and credentialing system to the industry subcouncil.

Expected Benefits

The intent of skill standards and credentialing systems is to promote investment in education and training and ensure that students and workers are trained to meet industry standards that are benchmarked to the state's major international competitors. Skill standards and credentialing systems have major benefits that impact students and workers, employers and educators in Illinois.

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Student and Worker Benefits

- Help workers make better decisions about the training they need to advance their careers
- Allow workers to communicate more effectively to employers what they know and can do
- Improve long-term employability by helping workers move more easily among work roles
- Enable workers to help their children make effective academic and career and technical decisions

Employer Benefits

- Focus the investment in training and reduce training costs
- Boost quality and productivity and create a more flexible workforce
- Improve employee retention
- Improve supplier performance
- Enlarge the pool of skilled workers

Educator Benefits

- Keep abreast of a rapidly changing workplace
- Contribute to curriculum and program development
- Provide students with better career advice
- Strengthen the relationship between schools and local businesses
- Communicate with parents because educators have up-to-date information about industry needs

The IOSSCC is currently working with the Illinois State Board of Education and other state agencies to integrate the occupational standards with the Illinois Learning Standards which describe what students should know and be able to do as a result of their education. The IOSSCC is also working to integrate workplace skills—problem solving, critical thinking, teamwork, etc.—with both the Illinois Learning Standards and the Illinois Occupational Skill Standards.

IOSSCC Requirements for Occupational Skill Standards

Illinois Occupational Skill Standards define what an individual should know and the expected level of performance required in an occupational setting. The standards focus on the most critical work performances for an occupation or occupational area.

Endorsed Occupations

Any occupational skill standards and credentialing system seeking IOSSCC endorsement must

- represent an occupation or occupational cluster that meets the criteria for IOSSCC endorsement, including economic development, earnings potential and job outlook;
- address both content and performance standards for critical work functions and activities for an occupation or occupational area;
- ensure formal validation and endorsement by a representative group of employers and workers within an industry;
- provide for review, modification and revalidation by an industry group a minimum of once every five years;
- award credentials based on assessment approaches that are supported and endorsed by the industry and consistent with nationally recognized guidelines for validity and reliability;
- provide widespread access and information to the general public in Illinois; and
- include marketing and promotion by the industry in cooperation with the partner state agencies.

Recognized Occupations

Occupations that do not meet the earnings criteria for IOSSCC endorsement but are part of an occupational cluster that is being developed may be presented for recognition by the IOSSCC. IOSSCC members encourage individuals to pursue occupational opportunities identified as endorsed occupations. Examples of occupations that do not meet the endorsement criteria, but have been recognized by the IOSSCC are Certified Nurse Assistant and Physical Therapy Aide.

Skill Standards Components

Illinois Occupational Skill Standards must contain the following components:

- Performance Area
- Performance Skill
- Skill Standard
- Performance Elements
- Performance Assessment Criteria

The IOSSCC further identified three components (*Conditions of Performance, Work to be Performed and Performance Criteria)* of the Skill Standard component as critical work functions for an occupation or industry/occupational area. The sample format for Illinois Occupational Skill Standards on the following page provides a description of each component of an occupational skill standard.

The sample format also illustrates the coding at the top of each page identifying the state, fiscal year in which standards were endorsed, Subcouncil abbreviation, cluster abbreviation and standard number. For example, the twenty-fifth skill standard in the Welding Cluster, which has been developed by the Manufacturing Subcouncil, would carry the following coding: IL.02.MFG.WC.25.

SUMMARY OF WORK TO BE PERFORMED. SUMMARY IS BRIEF AND BEGINS WITH AN ACTION VERB.

IL.FY.SUBCOUNCIL. CLUSTER. STANDARD NO.

PERFORMANCE AREA

SKILL STANDARD

CONDITIONS OF PERFORMANCE

A comprehensive listing of the information, tools, equipment and other resources provided to the person(s) performing the work.

WORK TO BE PERFORMED

An overview of the work to be performed in demonstrating the performance skill standard. This overview should address the major components of the performance. The detailed elements or steps of the performance are listed under "Performance Elements."

PERFORMANCE CRITERIA

The assessment criteria used to evaluate whether the performance meets the standard. Performance criteria specify product/outcome characteristics (e.g., accuracy levels, appearance, results, etc.) and process or procedure requirements (e.g., safety requirements, time requirements, etc.).

PERFORMANCE ELEMENTS

Description of the major elements or steps of the overall performance and any special assessment criteria associated with each element.

PERFORMANCE ASSESSMENT CRITERIA

Listing of required testing, certification and/or licensing.

Product and process used to evaluate the performance of the standard.

PRODUCT

Description of the product resulting from the performance of the skill standard.

PROCESS

Listing of steps from the Performance Elements which must be performed or the required order or performance for meeting the standard.

OCCUPATIONAL EARNINGS AND EMPLOYMENT INFORMATION
WELDING CLUSTER

I. Developmental Process and Occupational Definitions

A. Developmental Process

After reviewing the current labor market information, the Manufacturing Subcouncil recommended the development of skill standards for occupations in the welding industry. The identified career, welding, meets the criteria established by the Illinois Occupational Skill Standards and Credentialing Council (IOSSCC) for performance skill standard development, education and training requirements, employment opportunities, earnings potential and career opportunities. A product developer knowledgeable about welding began the process of performance skill identification. The product developer prepared an outline and framework designed to address the major skills expected in the workplace. The framework addresses skill requirements common to welding.

The subcouncil recommended the final skill standards product be presented to the IOSSCC. The IOSSCC reviewed the skill standards and met with the product developer, state liaison and chair of the subcouncil. Based on the review, the IOSSCC voted to endorse the welding skill standards.

1. Resources

Job descriptions from companies, qualification standards and competencies listed in related state and national welding programs were reviewed. Fabricating, production and maintenance personnel including welders and welding supervisory personnel were consulted. State representatives of the American Welding Society were interviewed and major national welding codes were reviewed. Reference material also included educational texts used by high schools, colleges and trade schools.

2. Standards Development Committee

A standards development committee composed of educators and experienced welders was convened. The framework, initial outline, matrix and draft skill standards were presented to the standards development committee for review, revision, adjustment and validation. Additional skill standard statements with performance elements and assessment criteria were developed in accordance with the direction established by the IOSSCC and were presented to the standards development committee for review and revision.

B. Occupational Definitions

Welding is the most common way of permanently joining metal parts. In this process, heat is applied to metal pieces, melting and fusing them to form a permanent bond. Because of its strength, welding is used in shipbuilding, automobile manufacturing and repair, aerospace applications and thousands of other manufactured products. Welding is also used to join beams when constructing buildings, bridges and other structures, and to join pipes in pipelines, power plants and refineries. Welders and welding machine operators use many types of welding equipment in a variety of positions such as flat, vertical, horizontal and overhead. They may perform manual welding, in which the work is entirely controlled by the welder, or semiautomatic welding, in which the welder uses machinery such as a wire feeder to help perform welding tasks.

Skilled welders generally plan work from drawings or specifications or by using their knowledge of welding and metals to analyze damaged metal parts. These workers then select and set up welding equipment and examine welds to insure they meet standards and/or specifications. Some welders, however, have more limited duties. They perform routine jobs that have already been planned and laid out and do not require extensive knowledge of welding techniques. Automated welding is used in an increasing number of production processes. In these instances a machine or robot performs the welding tasks while monitored by a welding machine operator. Welding machine operators set up and operate welding machines as specified by layouts, work orders or blueprints. Operators must load parts correctly and constantly monitor the machine to ensure that it produces the desired weld.

1. **Production Welder** welds together metal components of products such as automobiles, ships, aircraft, mobile homes and construction, mining and agriculture equipment as specified by layout, blueprints, diagram, work order, welding procedures or oral instructions using electric arc-welding equipment. Production welding is usually performed in a factory environment.

2. **Fitter/Fabricator Welder** fits and tack welds together subassemblies and parts using electric arc welding equipment. Products include ships, construction equipment, pipe systems and structural steel. The fitter/fabricator welder is often responsible for seam welding the fit subassemblies and parts and is responsible for preparing parts using metalworking and fabricating equipment.

3. **Maintenance Welder** weld repairs various process equipment including metalworking machines, construction and mining equipment and chemical and petroleum processing equipment. Most commercial metals and structural shapes may be welded using electric arc and gas welding processes. Fitting of pipe, fabricating of structural shapes and the use of metalworking equipment are generally part of the maintenance welder's responsibility.

4. **Construction/Code Welder** welds and fabricates metal components such as structural steel, boilers, pressure vessels, pipelines and tanks. Often the construction/code welder is a member of a trade union such as the Boilermakers, Iron Workers, or Pipe Fitters. Welding is generally performed on new construction or repair of existing facilities. The construction/code welder may be required to pass a national welding code test.

5. **Leadman/Supervisor** supervises the setup and operation of welding equipment and welding processes within a production facility. Other responsibilities may include supervision of production personnel, weld inspection and quality assurance, preparation of documentation, welding process development, programming of flexible automation equipment and welding equipment, selection of consumables and repair of welding equipment.

II. Employment and Earnings Opportunities

A. Education and Training Requirements

Training for welders can range from a few weeks of school or on-the-job training for low skilled positions to several years of combined school and on-the-job training for highly skilled jobs. Formal training is available in high schools, vocational schools and post secondary institutions such as vocational-technical institutions.

Community colleges offer courses leading to an entry level certificate in welding and often offer an associate degree in welding technology. Trade unions such as the Boilermakers and Ironworkers require welding training as part of their apprenticeship. The armed forces operate welding schools as well. For some welding critical to the operation of equipment, the armed forces will require qualification by testing of the welder. Some employers provide training to help welders improve their skills. Courses in blueprint reading, shop mathematics, mechanical drawing, physics, chemistry and metallurgy are helpful. Knowledge of computers is gaining importance, especially for welding machine operators, as some welders are becoming responsible for the programming of computer-controlled welding machines including robots.

In an effort to establish a minimum skill standard defining training and qualification requirements for welding, the American Welding Society (AWS) developed the *Guide for Training and Qualification of Entry Level Welders EG2.0*. This guide was developed through a grant from the U.S. Department of Education in accordance with AWS QC10, *Specification for the Qualification and Certification for Entry Level Welders*. The program is voluntary and may be used as a supplement to the Illinois Occupational Skill Standards for welding.

B. Employment Opportunities

In Illinois, average growth is expected in the employment of welders through 2008. As new welding technology is developed, demand for welders skilled in these methods will increase. The major factor affecting employment of welders is the health of the industries that employ these workers. In addition, welders will continue to be needed for maintenance and repair of existing infrastructures. Most job openings will result from the need to replace experienced workers who leave the labor force. Opportunities will be best for welders who are able to weld alloys and some of the new metals. Competition is expected to remain strong. The short-term forecast for welders and cutters is favorable.

C. Earnings Opportunities

	Middle Range Annual Earnings 1999*
Welder	$ 22,100 - $33,000

**Middle Range is the middle 50%, i.e., one-fourth of persons in the occupation earn below the bottom of the range and one-fourth of persons in the occupation earn above the top of the range.*

Sources: Illinois Department of Employment Security, Economic Information and Analysis Division.

Note: Although welder occupations can be categorized by the type of welding each performs, the wage range of these occupational definitions falls within the one title of Welder.

III. Assessment and Credentialing Systems

The IOSSCC recognizes that industry commitment for third-party assessment is beneficial and requests that each SDC and/or subcouncil identifies the most beneficial method for assessing the standards.

Although welding credentials are not always required, welders in the state of Illinois may be credentialed through specific company, local or national code tests. The performance qualification tests may be developed from national codes such as the American Welding Society Structural Steel Welding Code D1.1 and the American Society of Mechanical Engineers Boiler and Pressure Vessel Welding Code Section IX, or the test may be company specific. Welding supervisory personnel generally do not need credentials for employment but often entry into welding supervisory positions will require a minimum of an associate degree in welding or manufacturing technology.

IV. Industry Support and Commitment

The primary areas currently identified for industry support and commitment of occupational skill standards are development, updating and marketing. Business and industry partners may identify future uses of occupational skill standards such as credentialing/certification, career development of employees and specifications for out-source training programs.

A. Industry Commitment for Development and Updating

1. The development of skill standards for welding was achieved by the Manufacturing Subcouncil and the standards development committee. Names of the persons serving on the subcouncil and the standards development committee are located in the appendices.
2. In developing the products, the following steps were completed:
    - a. Identification and prioritization of a career ladder, identifying jobs by name
    - b. Review of resources
    - c. Development of draft matrix of performance standards
    - d. Development of a performance standard that was identified on the matrix
    - e. Convening of standards development committee of incumbent workers
    - f. Review, validation and approval of skill standards by the standards development committee
    - g. Review and approval of standards by subcouncil
    - h. Endorsement of skill standards by the IOSSCC

B. Industry Commitment for Marketing

The Manufacturing Subcouncil is committed to marketing and obtaining support and endorsement from the leading industry associations impacted by the skill standards. Upon recognition/endorsement of the standards by the IOSSCC, the subcouncil strongly recommends that professional trade groups, academic groups, etc. develop and provide an in-service/seminar package to promote skill standard awareness and obtain full industry support and commitment for the development of a full industry marketing plan.

The Manufacturing Subcouncil encourages the availability of skill standards to the public, including learners, parents, workers, educators at all levels, employers and industry personnel.

ASSUMPTIONS FOR WELDING CLUSTER SKILL STANDARDS

Skill standards assume that individuals have received education and/or training in a setting such as a secondary, postsecondary and/or apprenticeship/on-the-job training program and have the background knowledge necessary for performing the skill standards contained in this publication. The education and/or training includes instruction for the proper handling and operation of materials, tools and equipment required for performing the skills including the purpose of use, when to use, how to use and any related safety issues. The training program must adhere to all local, state and federal licensing and/or certification requirements as set by law, if applicable.

The Welding Cluster Standards Development Committee developed these skill standards based on the following assumptions:

1. Workplace skills (employability skills) are expected of the individual. Socialization skills needed for work are related to lifelong career experience and are not solely a part of the initial schooling process. These are not included with this set of statements.
2. Specific policies and procedures of the work site will be made known to the individual and will be followed.
3. Time elements outlined for the skill standards result from the experience and consideration of the panel of experts who made up the standards development committee.
4. Skills will progress from simple to complex. Once a skill has been successfully completed, it will be incorporated into more complex skills.
5. Skill standards describe the skill only and do not detail the background knowledge or theory related to the particular skill base. Although the skill standard enumerates steps to successful demonstration, rote approaches to the outcomes are not prescribed.
6. Skills will be completed in an expedient and safe manner.
7. Skill standards are selected because they meet workplace needs and are designed to meet professional standards of practice.
8. Skill standards do not replace, supersede or substitute for procedure manuals.
9. Skill standards do not supersede or take the place of industry certification or graduation from an accredited program of study.
10. Personal Protective Equipment (PPE) is available and correctly used.
11. Equipment is properly guarded and in good operating condition.
12. The time requirement suggested in the skill standard examples is for the performance of the weld or related skill only. The material is prepared, the joint is properly fitted, equipment is available and in good working order and there is conformance to all safety requirements.

PERFORMANCE SKILL LEVELS

	PRODUCTION WELDER	FITTER/FABRICATOR WELDER	MAINTENANCE WELDER	CONSTRUCTION/CODE WELDER	LEADMAN/SUPERVISOR
ANALYSIS					
Interpret and Explain Subassembly and/or Assembly Print	•	•	•	•	•
Interpret and Explain Welding Symbols	•	•	•	•	•
Interpret and Explain Print Views and Symbol Notes	•	•	•	•	•
Interpret and Explain Shop Traveler or Routing Sheet	•	•			•
Interpret Welding Procedures or Setup Instructions	•	•	•	•	•
SETUP					
Inspect Work Area for Safety Hazards and Safety Equipment	•	•	•	•	•
Employ Safe Working Practices	•	•	•	•	•
Handle Compressed Gases Safely	•	•	•	•	•
Perform Routine Maintenance	•	•	•	•	•
Mount Wire Electrode Coils	•	•	•	•	•
Adjust Welding Process Parameters	•	•	•	•	•
Place Parts and Subassemblies in Fixture	•				•
Adjust/Program Welding Parameters for Gas Metal Arc Welding – Pulse (GMAW-P)					•
Select Correct Program for Gas Metal Arc Welding – Pulse (GMAW-P)	•				•
Adjust/Program Welding Parameters for Gas Tungsten Arc Welding – Pulse (GTAW-P)			•		•
Select Correct Program for Gas Tungsten Arc Welding – Pulse (GTAW-P)	•		•		•
MATERIAL PREPARATION					
Use Manual Oxy-fuel Flame Cutting Equipment		•	•	•	
Use Manual Plasma Arc Cutting Equipment		•	•	•	
Use Manual Air Carbon Arc Cutting (CAC-A) Equipment	•	•	•	•	
Operate Shearing Equipment	•	•	•	•	
Operate Sawing Equipment	•	•	•	•	
Align and Fit Pipe	•	•	•	•	
Lay Out and Fit Assemblies and Subassemblies		•	•	•	•
SHIELDED METAL ARC WELDING (SMAW)					
Make Groove Weld in Flat Position on Carbon Steel Plate		•	•	•	•
Make Groove Weld in Horizontal, Vertical and Overhead Positions on Carbon Steel Plate		•	•	•	
Make Fillet Weld in Flat Position on Carbon Steel Plate		•	•	•	•
Make Fillet Weld in Horizontal, Vertical and Overhead Positions on Carbon Steel Plate		•	•	•	

PERFORMANCE SKILL LEVELS

SHIELDED METAL ARC WELDING (SMAW) (Continued)	PRODUCTION WELDER	FITTER/FABRICATOR WELDER	MAINTENANCE WELDER	CONSTRUCTION/CODE WELDER	LEADMAN/SUPERVISOR
Make Groove Weld in Flat Position on Stainless Steel Plate		•	•	•	•
Make Groove Weld in Horizontal, Vertical and Overhead Positions on Stainless Steel Plate		•	•	•	
Make Groove Weld in Flat Position on Carbon Steel Sheet		•	•	•	•
Make Fillet Weld in Flat Position on Carbon Steel Sheet		•	•	•	•
Make Fillet Weld in Horizontal, Vertical and Overhead Positions on Carbon Steel Sheet		•	•	•	
Make Groove Weld in All Positions on Carbon Steel Pipe			•	•	
Make Full Joint Penetration Groove Weld in All Positions on Carbon Steel Pipe			•	•	
Make Weld in All Positions on Carbon Steel Process Equipment			•		
Make Weld in All Positions on Cast Iron Process Equipment			•		
Make Groove Weld in All Positions on Stainless Steel Sheet		•	•	•	
Make Fillet Weld in All Positions on Stainless Steel Sheet		•	•	•	
Make Groove Weld in All Positions on Stainless Steel Pipe			•	•	
Make Full Joint Penetration Groove Weld in All Positions on Stainless Steel Pipe			•	•	
GAS METAL ARC WELDING (GMAW)					
Make Fillet Weld in Flat Position Using Spray Transfer on Carbon Steel Plate	•	•	•		•
Make Fillet Weld in Horizontal and Vertical (Down) Positions Using Spray Transfer on Carbon Steel Plate	•	•	•		
Make Fillet Weld in Flat Position Using Short Circuit Transfer on Carbon Steel Plate	•	•	•	•	•
Make Fillet Weld in Horizontal, Vertical (Up and Down) and Overhead Positions Using Short Circuit Transfer on Carbon Steel Plate	•	•	•	•	
Make Groove Weld in Flat Position Using Spray Transfer on Carbon Steel Plate	•	•			•
Make Multiple Pass Fillet Weld in Flat Position Using Spray Transfer on Carbon Steel Plate	•	•			•
Make Groove Weld in Horizontal and Vertical (Down) Positions Using Spray Transfer on Carbon Steel Plate	•	•	•		
Make Groove Weld in Flat Position Using Short Circuit Transfer on Carbon Steel Plate	•	•			•
Make Multiple Pass Fillet Weld in Flat Position Using Short Circuit Transfer on Carbon Steel Plate	•	•		•	•
Make Groove Weld in Horizontal, Vertical (Up and Down) and Overhead Positions Using Short Circuit Transfer on Carbon Steel Plate	•	•	•		

PERFORMANCE SKILL LEVELS

FLUX CORE ARC WELDING (FCAW)	PRODUCTION WELDER	FITTER/FABRICATOR WELDER	MAINTENANCE WELDER	CONSTRUCTION/CODE WELDER	LEADMAN/SUPERVISOR
Make Groove Weld in All Positions on Carbon Steel Sheet	•	•	•	•	
Make Fillet Weld in All Positions on Carbon Steel Sheet	•	•	•	•	
Make Groove Weld in Horizontal, Vertical (Up and Down) and Overhead Positions on Carbon Steel Plate	•	•	•		
Make Vee-groove Weld in Flat Position on Carbon Steel Plate	•	•	•		•
Make Groove Weld in Flat Position on Carbon Steel Plate	•	•	•		•
Make Fillet Weld in Horizontal, Vertical (Up and Down) and Overhead Positions on Carbon Steel Plate	•	•	•		
Make Multiple Pass Fillet Weld in Flat and Horizontal Positions on Carbon Steel Plate	•	•	•		
SUBMERGED ARC WELDING (SAW)					
Make Vee-groove Weld in Flat Position on Carbon Steel Plate	•	•			
Make Fillet Weld in Flat and Horizontal Positions on Carbon Steel Plate	•	•			
Gas Tungsten Arc Welding (GTAW)					
Make Groove Weld in Flat Position on Carbon Steel Sheet	•	•	•	•	•
Make Groove Weld in Horizontal, Vertical and Overhead Positions on Carbon Steel Sheet	•	•	•	•	
Make Fillet Weld in Flat Position on Carbon Steel Sheet	•	•	•	•	•
Make Fillet Weld in Horizontal, Vertical and Overhead Positions on Carbon Steel Sheet	•	•	•	•	
Make Groove Weld on Carbon Steel Tube	•	•	•	•	
Make Vee-groove Weld on Carbon Steel Pipe	•	•	•	•	
Make Groove Weld in Flat Position on Stainless Steel Sheet	•	•	•	•	•
Make Groove Weld in Horizontal and Vertical Positions on Stainless Steel Sheet	•	•	•	•	
Make Fillet Weld in Flat Position on Stainless Steel Sheet	•	•	•	•	•
Make Fillet Weld in Horizontal and Vertical Positions on Stainless Steel Sheet	•	•	•	•	
Make Groove Weld on Stainless Steel Tube	•	•	•	•	
Make Vee-groove Weld on Stainless Steel Pipe	•	•	•	•	
Make Groove Weld in Flat Position on Aluminum Sheet	•	•	•	•	
Make Fillet Weld in Flat Position on Aluminum Sheet	•	•	•	•	•

PERFORMANCE SKILL LEVELS

	PRODUCTION WELDER	FITTER/FABRICATOR WELDER	MAINTENANCE WELDER	CONSTRUCTION/CODE WELDER	LEADMAN/SUPERVISOR
SURFACE WELDING					
Make Surface Welds	●		●	●	
QUALITY ASSURANCE AND DOCUMENTATION					
Inspect Welds for Visual Discontinuities	●	●	●	●	●
Complete Required Quality Assurance Documentation	●		●	●	●
Identify Materials			●	●	●
Sketch Revisions			●	●	●
Develop Welding Procedures					●
Perform Welder Performance Destructive Testing					●
Troubleshoot Welding Process Problems					●
Measure Fillet and Groove Welds	●	●	●	●	●
AUTOMATED AND MECHANIZED WELDING					
Operate Robot Welding System	●				●
Set Welding Gun Tool Definition/Tool Center Point (TCP) for Robot Welding	●				●
Set Up and Operate Computer Numerical Control (CNC) Oxy-fuel Cutting (OFC) System		●			●
Operate Mechanized Gas Metal Arc Welding (GMAW) System	●				●
Operate Mechanized Submerged Arc Welding (SAW) System	●				●
Operate Resistance Spot (RSW) and Projection Welding (PW) System	●	●			●
Operate Capacitor Discharge Projection Welding System	●			●	●

INTERPRET AND EXPLAIN SUBASSEMBLY AND/OR ASSEMBLY PRINT.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Standard part print
Reference material
Conversion tables

WORK TO BE PERFORMED

Interpret and explain subassembly and/or assembly print to members of manufacturing team.

PERFORMANCE CRITERIA

Principle views, critical dimensions, joint types and print notes are stated correctly.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the number and complexity of the views, dimensions and notes found on the print.

(Example: A standard three view orthographic projection with ten overall or feature dimensions and standard notes is explained in ten minutes.)

PERFORMANCE ELEMENTS

1. Review the print.
2. Gather reference material and conversion tables as needed.
3. Determine type of print and views used.
4. Determine critical dimensions.
5. Analyze the supplementary data found on the print.
6. Demonstrate understanding by explaining the print to another member of the manufacturing team.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

The subassembly and/or assembly print is interpreted and explained correctly.

PROCESS

All performance elements for interpreting and explaining subassembly and/or assembly print are critical and must be performed in sequence.

INTERPRET AND EXPLAIN WELDING SYMBOLS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Standard part print
Reference material
Conversion tables

WORK TO BE PERFORMED

Interpret and explain welding symbols to members of manufacturing team.

PERFORMANCE CRITERIA

Type, size, joint preparation and location of weld are stated correctly.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the number and complexity of the symbols found on the print.

(Example: A standard three view orthographic projection with three fillet weld symbols and three groove weld symbols is explained in ten minutes.)

PERFORMANCE ELEMENTS

1. Review the print for welding symbols.
2. Gather reference material and conversion tables as needed.
3. Determine location of the required weld.
4. Determine the type of required weld.
5. Analyze the supplementary data found with the symbol.
6. Demonstrate understanding by explaining the symbols to another member of the manufacturing team.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

Welding symbols are interpreted and explained correctly.

PROCESS

All performance elements for interpreting and explaining welding symbols are critical and must be performed in sequence.

INTERPRET AND EXPLAIN PRINT VIEWS AND SYMBOL NOTES.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Standard part print
Reference material
Conversion tables

WORK TO BE PERFORMED

Interpret and explain print views and symbol notes on a standard print to members of manufacturing team.

PERFORMANCE CRITERIA

Principle views and symbol print notes are stated correctly.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the number and complexity of the views, dimensions and notes found on the print.

(Example: A standard three view orthographic projection with a removed section view is explained in ten minutes.)

PERFORMANCE ELEMENTS

1. Review the print and check for dimensional, geometric and tolerance errors.
2. Gather reference material and conversion tables as needed.
3. Determine type of print and views used.
4. Interpret additional views and notes found on the print.
5. Demonstrate understanding by explaining the print to another member of the manufacturing team.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

Print views and symbol notes are interpreted and explained correctly.

PROCESS

All performance elements for interpreting and explaining print views and symbol notes are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

INTERPRET AND EXPLAIN SHOP TRAVELER OR ROUTING SHEET.

ANALYSIS

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Standard part print
Shop traveler or routing sheet
Reference material

WORK TO BE PERFORMED

Interpret and explain shop traveler or routing sheet to members of manufacturing team.

PERFORMANCE CRITERIA

Sequence of operations, part and process identification numbers and related print identification numbers are stated correctly.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the number and complexity of the shop traveler or routing sheet.

(Example: A standard ten operation shop traveler or routing sheet is interpreted and explained in ten minutes.)

PERFORMANCE ELEMENTS

1. Review the shop traveler or routing sheet.
2. Gather reference material.
3. Determine the identification numbers for the associated print.
4. Interpret the sequence of operations.
5. Demonstrate understanding by explaining the shop traveler or routing sheet to another member of the manufacturing team.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

The shop traveler or routing sheet is interpreted and explained correctly.

PROCESS

All performance elements for interpreting and explaining the shop traveler or routing sheet are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Standard part print
Welding procedure or setup instructions
Conversion tables
Reference material

WORK TO BE PERFORMED

Interpret and set up welding equipment per welding procedure or setup instructions.

PERFORMANCE CRITERIA

Welding equipment is set up per welding procedure or setup instructions.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the welding process and the complexity of the welding equipment.

(Example: A standard gas metal arc welding (GMAW) machine is set up per welding procedure or setup instructions in four minutes.)

PERFORMANCE ELEMENTS

1. Review the welding procedure or setup instructions.
2. Set the voltage, amperage and polarity to the correct value per procedure or setup instructions.
3. Set the gas flow and/or wire feed rate at the correct value per welding procedure or setup instructions.
4. Set all switches and ancillary settings per welding procedure or setup instructions.
5. Review the technique and weld bead sequence.
6. Locate the required cleaning tools if necessary.
7. Determine joint and/or material preparation requirements per welding procedure or setup instructions.
8. Determine the preheat and postheat requirements.
9. Review any special instructions or requirements.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

The welding machine is set up correctly and the appropriate ancillary equipment is located.

PROCESS

All performance elements for interpreting the welding procedures or setup instructions are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

INSPECT WORK AREA FOR SAFETY HAZARDS AND SAFETY EQUIPMENT.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Material Safety Data Sheets (MSDS)
Company safety guidelines
Local, state and federal safety guidelines
American Welding Society Z49.1 *Safety in Welding Cutting and Allied Processes*
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Inspect work area and identify safety hazards and safety equipment.

PERFORMANCE CRITERIA

Safety hazards within the work area are identified and removed or repaired according to company safety guidelines.

Equipment required for a safe work environment is present.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the number of safety hazards and complexity of the safety equipment.

(Example: A production welding area is inspected and all safety hazards and safety equipment are identified in ten minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE as necessary.
2. Review the appropriate company safety documents.
3. Review any appropriate local, state and federal safety guidelines, if necessary.
4. Review MSDS as related to welding.
5. Inspect the work area.
6. Identify safety hazards and repair or remove, if necessary.
7. Assure safety equipment such as fire extinguishers, fire blankets and eye wash are present.
8. Demonstrate understanding by explaining the safety hazards and equipment associated with welding processes to a member of the manufacturing team or supervisor.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Local, state and federal safety guidelines are followed.

PRODUCT

Work area is inspected and safety hazards and safety equipment are identified.

PROCESS

All performance elements for inspecting work area for safety hazards and safety equipment are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

EMPLOY SAFE WORKING PRACTICES.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Material Safety Data Sheets (MSDS)
Company safety guidelines
Local, state and federal safety guidelines
American Welding Society Z49.1 *Safety in Welding Cutting and Allied Processes*
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Employ safe working practices.

PERFORMANCE CRITERIA

Safe working practices are employed according to company safety guidelines.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the complexity of the safety practices and processes employed.

(Example: Safe working practices required to fixture and production weld a subassembly within a production welding facility are described in ten minutes.)

PERFORMANCE ELEMENTS

Note: Depending upon the processes and safety practices employed by the company, some performance elements may not apply.

1. Put on PPE as necessary.
2. Review the appropriate company safety documents.
3. Review any appropriate local, state and federal safety guidelines, if necessary.
4. Review MSDS as related to welding practice.
5. Obtain permits required prior to welding such as those pertaining to confined space, hot work and volatile atmosphere or obtain company specific permits.
6. Employ safety practices needed to handle and operate fuel, shielding and oxidizing gases such as pressure reducing and relief equipment; check valves, valve protection, thread type and wrenches.
7. Employ safety practices needed to work with electrical equipment such as the proper use of grounding, identification of worn cables and exposed voltage/current transformation components.
8. Employ the appropriate method for lifting heavy objects and equipment.
9. Follow radiation protection requirements.
10. Utilize ventilation and fume reduction methods.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Local, state and federal safety guidelines are followed.

PRODUCT

Safe working practices are employed.

PROCESS

All performance elements for employing safe working practices are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

HANDLE COMPRESSED GASES SAFELY.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Material Safety Data Sheets (MSDS)
Manufacturers' recommendations
Company safety guidelines
Local, state and federal safety guidelines
American Welding Society Z49.1 *Safety in Welding Cutting and Allied Processes*
Safe Handling of Compressed Gasses in Containers; Cylinder Gas Association (4-14-01)
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Handle compressed gases safely.

PERFORMANCE CRITERIA

Safe working practices associated with handling compressed gas cylinders and regulating equipment are employed according to company safety guidelines.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with type of compressed gas.

(Example: Oxygen cylinder is safely retrieved from near-by storage area and regulator attached to cylinder in ten minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review appropriate company safety documents.
3. Review any appropriate local, state and federal safety guidelines, if necessary.
4. Review MSDS as related to welding practice.
5. Locate storage area for compressed gas.
6. Check protector cap before moving cylinder.
7. Use approved method for moving cylinder to production facility.
8. Inspect cylinder holding chains or cylinder support devices.
9. Move cylinder to appropriate location and secure. Make sure cylinder is held in a vertical position.
10. Remove protector cap. DO NOT pry on cap.
11. Inspect valve for damage and report any visible damage to supervisor. DO NOT open any valve that shows damage.

12. Hold cylinder securely, point valve away from self and other personnel and open valve slightly to blow any material from valve.
13. Check regulator to assure that it is correct for gas selected.
14. Inspect regulator and gauges for damage. Report any visible damage to supervisor.
15. Inspect threads on cylinder valve and on regulator for damage. Report any visible damage to supervisor.
16. Thread regulator by hand onto cylinder. When hand tight, use appropriate wrench to tighten regulator fitting onto cylinder. Make sure no reactive material (i.e., petroleum for compressed oxygen) is on wrench.
17. Loosen pressure adjusting mechanism on regulator.
18. Turn on tank or line valve according to manufacturer's recommendations and adjust regulator for proper pressure.
19. Inspect regulator, fittings and safety devices for proper operation.
20. Using approved leak detection techniques, check fitting for leaks.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Local, state and federal safety guidelines are followed.

PRODUCT

Compressed gas cylinders are safely handled.

PROCESS

All performance elements for the safe handling of compressed gases are critical and must be performed in sequence.

PERFORM ROUTINE MAINTENANCE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Welding equipment and manuals
Standard tool kit
Manufacturers' specifications
Company policy and procedures

WORK TO BE PERFORMED

Perform routine maintenance on welding equipment.

PERFORMANCE CRITERIA

Required routine maintenance is completed according to manufacturers' and/or company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the volume and complexity of routine maintenance required.

(Example: A gas metal arc welding (GMAW) machine and wire feeder are inspected and routine maintenance performed in ten minutes or less.)

PERFORMANCE ELEMENTS

Note: Depending upon the processes and safety practices employed by the company, some performance elements may not apply.

1. Put on PPE.
2. Review the appropriate equipment manual or company maintenance procedures.
3. Inspect work area for safety hazards.
4. Complete lock out/tag out safety procedures if necessary.
5. Inspect oxy-fuel equipment and perform routine maintenance as required.
    a. Inspect line or tank valves for damage. Report damage to supervisor or appropriate company personnel.
    b. Inspect equipment for required safety equipment such as check valves, flashback arrestors and pressure relief valves. Report missing safety equipment to supervisor or appropriate company personnel.
    c. Inspect regulators and gauges. Report damage to supervisor or appropriate company personnel.
    d. Inspect fittings and connections; tighten as necessary.
    e. Inspect torch tips and torch nuts; clean and replace as necessary.

6. Inspect shielded arc welding equipment and perform routine maintenance as required.
    a. Inspect machine for large arc strikes and damage. Report damage to supervisor or appropriate company personnel.
    b. Inspect electrode and ground cables for damage; repair or replace as necessary.
    c. Inspect electrode and ground connections at the machine and at the electrode holder and ground clamp; tighten fasteners as necessary.
    d. Inspect electrode holder and ground clamp; clean or replace as necessary.
    e. Inspect switches and adjusting knobs for damage. Report damage to supervisor or appropriate company personnel.
7. Inspect gas metal arc and flux core welding equipment. Perform routine maintenance as required.
    a. Inspect machine and wire feeder for large arc strikes and damage. Report damage to supervisor or appropriate company personnel.
    b. Inspect electrode and ground connections at the machine. Tighten fasteners as necessary.
    c. Inspect ground cable and gun assembly for damage; repair or replace as necessary.
    d. Inspect gun nozzle, gas diffuser and contact tip; clean or replace as necessary.
    e. Inspect coil mounting and coil break; adjust as necessary.
    f. Inspect wire dereeler mechanism; adjust as necessary.
    g. Inspect flowmeter and hose connections; tighten as necessary.
    h. Inspect drive rollers and wire guides for wear. Report damage or wear to supervisor or appropriate company personnel.
    i. Adjust tension of drive rollers as necessary.
8. Remove weld spatter and foreign material from guns, torches or electrode holders.
9. Inspect associated equipment such as hand tools, fixtures, lifting devices and tables.
10. Inspect and clean work area per company procedures.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

Required routine maintenance is completed.

PROCESS

All performance elements for performing routine maintenance are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

MOUNT WIRE ELECTRODE COILS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Welding equipment and manuals
Standard tool kit
Company policy and procedures

WORK TO BE PERFORMED

Mount wire electrode coil on wire feeder or place coil or spool in appropriate area.

PERFORMANCE CRITERIA

Wire electrode coil is mounted on a wire feeder or coil or spool is placed in appropriate area for proper feeder operation.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the size of the electrode coil and the type of wire feeder.

(Example: A 45-pound coil of 0.035-inch (.9 mm) ER70S-3 wire is mounted and wire is fed through contact tip in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the appropriate equipment manual or company procedures.
3. Inspect work area for safety hazards.
4. Determine the wire diameter and type.
5. Locate the appropriate diameter and type of wire for replacement.
6. Remove the spent coil reel or wire holding mechanism.
7. Loosen drive roller tensioning adjustment.
8. Cut any wire in the gun liner and remove.
9. Remove nozzle and contact tip from the gun assembly.
10. Mount the new wire with the correct dereeling position of the wire.
11. Tighten the coil holding mechanism.
12. Locate the end of the wire and secure while cutting the coil tie wires.
13. Feed the wire through the wire guides and drive rollers.
14. Feed the wire through the liner.
15. Tighten and adjust the wire tensioning adjustments.
16. Feed the wire through the liner to the gun.
17. Assemble the welding gun.

18. Cut off excessive wire stickout.
19. Adjust the coil tensioner as necessary.
20. Make test welds to assure proper operation.
21. Inspect and adjust wire tension adjustments as needed.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

Wire electrode coil is mounted on wire feeder or coil or spool is placed in appropriate area.

PROCESS

All performance elements for mounting wire electrode coils on wire feeder or placing coil or spool in appropriate area are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

ADJUST WELDING PROCESS PARAMETERS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Welding procedure or setup instructions
Welding equipment and manuals
Standard tool kit
Electrode manufacturer's recommendations

WORK TO BE PERFORMED

Adjust welding process parameters.

PERFORMANCE CRITERIA

Welding process parameters are adjusted for material being welded or per welding procedure or setup instructions.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the welding process and the type of welding equipment used.

(Example: A standard transformer/rectifier welding power supply for welding with a 1/8-inch (3 mm) diameter E7018 electrode is adjusted in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print and/or specification or inspect the metal to be welded.
3. Inspect work area for safety hazards.
4. Review the welding procedure or setup instructions or determine the welding parameters based upon the metal type, electrode type, welding position, metal thickness and electrode manufacturer's recommendations.
5. Locate the polarity switch and move to the correct polarity or change the electrode and ground cable positions.
6. Adjust the voltage and/or amperage per procedure, setup instructions or determined parameters.
7. Set the wire feed rate if necessary.
8. Set the shielding gas flow or pressure as necessary.
9. Make test welds.
10. Adjust welding parameters as necessary.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

The welding process parameters are properly adjusted.

PROCESS

All performance elements for adjusting welding process parameters are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

PLACE PARTS AND SUBASSEMBLIES IN FIXTURE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Welding procedure or setup instructions
Parts and subassemblies
Standard tool kit

WORK TO BE PERFORMED

Place parts and subassemblies in fixture.

PERFORMANCE CRITERIA

Parts and subassemblies are placed in fixture per print, welding procedure or setup instructions.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the number, size and complexity of the parts and subassemblies.

(Example: Two subassemblies and ten parts are placed into a fixture in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print, welding procedure or setup instructions.
3. Inspect work area for safety hazards.
4. Locate parts or subassemblies needed.
5. Determine the part and subassembly location in the fixture or follow the procedure or setup instructions.
6. Determine the order for part and subassembly placement.
7. Place parts and subassemblies in fixture.
8. Tighten all holding and positioning clamps.
9. Inspect the assembly.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

Parts and subassemblies are placed correctly in the fixture.

PROCESS

All performance elements for placing parts and subassemblies in fixture are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

ADJUST/PROGRAM WELDING PARAMETERS FOR GAS METAL ARC WELDING – PULSE (GMAW-P).

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Welding procedure or setup instructions
Welding equipment and manuals
Standard tool kit
Electrode manufacturer's recommendations

WORK TO BE PERFORMED

Adjust/program welding parameters for GMAW-P.

PERFORMANCE CRITERIA

Welding parameters for GMAW-P are adjusted/programmed for material being welded or per welding procedure or setup instructions.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the welding process and the type of welding equipment used.

(Example: A GMAW-P power supply for welding .375-inch (10 mm) carbon steel plate using 0.035-inch (.9mm) diameter ER70S-3 electrode and 90% argon/10% CO2 shielding gas is adjusted/programmed in five minutes.)

PERFORMANCE ELEMENTS

Note: This skill should only be performed by qualified personnel.

1. Put on PPE.
2. Review the specification or inspect the metal to be welded.
3. Inspect work area for safety hazards.
4. Review the welding procedure or setup instructions or determine the welding parameters based upon the metal type, electrode type, welding position, metal thickness and electrode manufacturer's recommendations.
5. Set tentative voltage peak and background values.
6. Set tentative voltage peak and background time constants.
7. Set wire feed rate.
8. Set the shielding gas flow or pressure as necessary.
9. Make test welds.
10. Adjust voltage peak and background values and voltage peak and background time constants necessary.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

Welding parameters for GMAW-P are adjusted/programmed correctly.

PROCESS

All performance elements for adjusting/programming welding parameters for GMAW-P are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SELECT CORRECT PROGRAM FOR GAS METAL ARC WELDING – PULSE (GMAW-P).

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Welding procedure or setup instructions
Welding equipment and manuals
Standard tool kit
Power supply manufacturer's recommendations

WORK TO BE PERFORMED

Select correct program for GMAW-P.

PERFORMANCE CRITERIA

Correct program is selected for GMAW-P for material being welded or per welding procedure or setup instructions.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the welding process and the type of welding equipment used.

(Example: Correct program GMAW-P power supply for welding .50-inch (13 mm) carbon steel plate using a 0.035-inch (.9 mm) diameter ER70S-3 electrode and 90% argon/10% CO2 shielding gas is selected in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print or specification or inspect the metal to be welded.
3. Inspect work area for safety hazards.
4. Review the welding procedure or setup instructions or determine the welding parameters based upon the metal type, electrode type, welding position, metal thickness and power supply manufacturer's recommendations.
5. Locate the program readout or LCD on the power supply.
6. Press the program select button on the power supply.
7. Press the scroll/change button until the correct program per procedure, setup instructions or material type is displayed.
8. Adjust the trim or fine voltage adjustment per procedure, setup instructions or material type.
9. Adjust the wire feed rate procedure, setup instructions or material type.
10. Set the shielding gas flow or pressure as necessary.
11. Make test welds.
12. Make fine adjustments as required or possible.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

Correct program for GMAW-P is selected.

PROCESS

All performance elements for selecting correct program for GMAW-P are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

ADJUST/PROGRAM WELDING PARAMETERS FOR GAS TUNGSTEN ARC WELDING – PULSE (GTAW-P).

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Welding procedure or setup instructions
Welding equipment and manuals
Standard tool kit
Electrode manufacturer's recommendations

WORK TO BE PERFORMED

Adjust/program welding parameters for GTAW-P.

PERFORMANCE CRITERIA

Welding parameters are adjusted/programmed for GTAW-P for material being welded or per welding procedure or setup instructions.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the welding process and the type of welding equipment used.

(Example: GTAW-P power supply for welding .12-inch (3 mm) carbon steel sheet using a 3/32-inch diameter EWTh-2 electrode and 100% argon shielding gas is adjusted/programmed in five minutes.)

PERFORMANCE ELEMENTS

Note: This skill should only be performed by qualified personnel.

1. Put on PPE.
2. Review the print and/or specification or inspect the metal to be welded.
3. Inspect work area for safety hazards.
4. Review the welding procedure or setup instructions or determine the welding parameters based upon the metal type, electrode type, welding position, metal thickness and electrode manufacturer's recommendations.
5. Set tentative voltage peak and background values.
6. Set tentative voltage peak and background time constants.
7. Set the shielding gas flow or pressure as necessary.
8. Make test welds.
9. Adjust voltage peak and background values and voltage peak and background time constants necessary.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

Welding parameters for GTAW-P are adjusted/programmed correctly.

PROCESS

All performance elements for adjusting/programming welding parameters for GTAW-P are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SELECT CORRECT PROGRAM FOR GAS TUNGSTEN ARC WELDING – PULSE (GTAW-P).

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Welding procedure or setup instructions
Welding equipment and manuals
Standard tool kit
Power supply manufacturer's recommendations

WORK TO BE PERFORMED

Select correct program for GTAW-P.

PERFORMANCE CRITERIA

Correct program is selected for GTAW-P for material being welded or per welding procedure or setup instructions.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the welding process and the type of welding equipment used.

(Example: Correct program GTAW-P power supply for welding .12-inch (3 mm) carbon steel sheet using 3/32-inch diameter EWTh-2 electrode and 100% argon shielding gas is selected in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print and/or specification or inspect the metal to be welded.
3. Inspect work area for safety hazards.
4. Review the welding procedure or setup instructions or determine the welding parameters based upon the metal type, electrode type, welding position, metal thickness and power supply manufacturer's recommendations.
5. Locate the program readout or LCD on the power supply.
6. Press the program select button on the power supply.
7. Press the scroll/change button until the correct program per the procedure, setup instructions or material type is displayed.
8. Set the shielding gas flow or pressure as necessary.
9. Make test welds.
10. Make fine adjustments as required or possible.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

Correct program for GTAW-P is selected.

PROCESS

All performance elements for selecting correct program for GTAW-P are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

USE MANUAL OXY-FUEL FLAME CUTTING EQUIPMENT.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make oxy-fuel flame cuts on carbon steel plate.

PERFORMANCE CRITERIA

Flame cuts on carbon steel plate are completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A .25-inch (6 mm) carbon steel plate is flame cut 18 inches long in one minute.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print for correct cut.
3. Inspect work area for safety hazards.
4. Loosen pressure-adjusting handles on the regulators.
5. Turn on main line or cylinder valves.
6. Adjust pressures for the steel thickness.
7. Light torch and adjust the flame.
8. Make test cuts on carbon steel plate.
9. Adjust pressures and torch angles as necessary.
10. Complete cuts as required by print or job specifications.
11. Shut down and secure equipment.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Oxy-fuel flame cuts on carbon steel plate are completed.

PROCESS

All performance elements for making oxy-fuel flame cuts on carbon steel plate are critical and must be performed in sequence.

USE MANUAL PLASMA ARC CUTTING EQUIPMENT.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make plasma arc cuts on specified material.

PERFORMANCE CRITERIA

Plasma arc cuts on specified material are completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long plasma arc cut on .25-inch (6 mm) carbon steel plate is completed in 30 seconds.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print for correct cut.
3. Inspect work area for safety hazards.
4. Turn on main line plasma gas valve.
5. Turn power off and inspect torch nozzle and electrode for damage.
6. Adjust amperage for the material type thickness.
7. Make test cuts on specified material.
8. Adjust amperage and torch angles as necessary.
9. Complete cuts as required by print or job specifications.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Plasma arc cuts on specified material are completed.

PROCESS

All performance elements for making plasma arc cuts on specified material are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

USE MANUAL AIR CARBON ARC CUTTING (CAC-A) EQUIPMENT.

MATERIAL PREPARATION

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make air carbon arc cuts on specified material.

PERFORMANCE CRITERIA

Air carbon arc cuts on specified material are completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch back cut on carbon steel butt joint is completed in one minute.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards and other personnel in the area.
4. Turn on main air line valve.
5. Adjust air pressure for the electrode diameter and material thickness.
6. Adjust amperage and current type for the electrode diameter and material thickness.
7. Make test cuts on specified material.
8. Adjust amperage and torch angles as necessary.
9. Complete cuts as required by print or job specifications.
10. Remove slag and carbon residue as necessary.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Air carbon arc cuts on specified material are completed.

PROCESS

All performance elements for making air carbon arc cuts on specified material are critical and must be performed in sequence.

OPERATE SHEARING EQUIPMENT.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job Specifications
Shearing equipment and materials
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make shear cuts on plate and sheet.

PERFORMANCE CRITERIA

Shear cuts on plate and sheet are completed according to standard part print and/or job specifications.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with job specifications.

(Example: A 12-inch by 6-inch by .25-inch (6 mm) thick carbon steel plate per print specifications is cut in 30 seconds.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print.
3. Inspect work area for safety hazards.
4. Adjust or attach required safety guards.
5. Adjust hold-down bar, back gage, or squaring device as necessary.
6. Place material on the in-feed table.
7. Make test cuts.
8. Adjust material position as necessary.
9. Complete cuts as required by print or job specifications.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Shear cuts on plate and sheet are completed.

PROCESS

All performance elements for making shear cuts on plate and sheet are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Sawing equipment and materials
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make saw cuts on various plate, pipe and structural materials.

PERFORMANCE CRITERIA

Saw cuts on various plate, pipe and structural material are completed according to standard part print and/or job specifications.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A .25-inch thick, 3-inch by 3-inch by 12-inch long carbon steel angle iron is cut from a standard stock length in 30 seconds.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print.
3. Inspect work area for safety hazards.
4. Adjust or attach required safety guards.
5. Adjust holding devices as necessary.
6. Place material in the holding device.
7. Adjust the blade velocity as necessary.
8. Make test cuts.
9. Adjust material position and blade velocity as necessary.
10. Complete cuts as required by print or job specifications.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Saw cuts on various plate, pipe and structural materials are completed.

PROCESS

All performance elements for making saw cuts on various plate, pipe and structural materials are critical and must be performed in sequence.

ALIGN AND FIT PIPE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Align and fit pipe.

PERFORMANCE CRITERIA

Pipe is aligned and fitted according to standard part print or job specifications.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 3-inch diameter schedule 40 6-inch long carbon steel pipe is aligned and fitted in five minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Inspect joint for the proper geometry.
5. Align and fit the pipe to be level and/or plumb per print, job specification or as necessary.
6. Place tack weld.
7. Adjust and realign pipe as necessary.
8. Place remaining tack welds.
9. Remove all slag or other detrimental material.
10. Inspect tack welds.
11. Inspect alignment.
12. Inspect joint.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Pipe is aligned and fitted.

PROCESS

All performance elements for aligning and fitting pipe are critical and must be performed in sequence.

LAY OUT AND FIT ASSEMBLIES AND SUBASSEMBLIES.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job Specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Lay out and fit assemblies and subassemblies per print.

PERFORMANCE CRITERIA

Assemblies and subassemblies are laid out and fitted per standard part print or job specifications.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: Three vertical plates are laid out and fitted on horizontal plate in ten minutes.

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print part placement.
3. Inspect work area for safety hazards.
4. Review print of job specification.
5. Layout and fit assemblies and subassemblies per print, job specification or as necessary.
6. Place tack welds.
7. Adjust and realign assemblies and subassemblies as necessary.
8. Place remaining tack welds.
9. Remove all slag or other detrimental material.
10. Inspect tack welds.
11. Inspect alignment.
12. Inspect layout.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Assemblies and subassemblies are laid out and fitted per print.

PROCESS

All performance elements for laying out and fitting assemblies and subassemblies are critical and must be performed in sequence.

MAKE GROOVE WELD IN FLAT POSITION ON CARBON STEEL PLATE.

IL.02.MFG.WC.24

SHIELDED METAL ARC WELDING (SMAW)

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job Specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make groove weld in flat position on carbon steel plate.

PERFORMANCE CRITERIA

Groove weld in flat position on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long square-groove weld is placed on .25-inch (6 mm) thick carbon steel plate with an E7018 .12-inch (3 mm) diameter electrode in five minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMAW welding.
6. Make test weld on carbon steel plate.
7. Adjust parameters and electrode angles as necessary.
8. Complete weld as required by print.
9. Remove all slag between weld passes and at completion.
10 Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in flat position on carbon steel plate is completed.

PROCESS

All performance elements for making groove weld in flat position on carbon steel plate are critical and must be performed in sequence.

MAKE GROOVE WELD IN HORIZONTAL, VERTICAL AND OVERHEAD POSITIONS ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job Specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make groove weld in horizontal, vertical and overhead positions on carbon steel plate.

PERFORMANCE CRITERIA

Groove weld in horizontal, vertical and overhead positions on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long square-groove weld in horizontal position is placed on .25-inch (6 mm) thick carbon steel plate with an E7018 .12-inch (3 mm) diameter electrode in five minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMAW (for the position selected).
6. Make test weld on carbon steel plate.
7. Adjust parameters and electrode angles as necessary.
8. Complete weld as required by print.
9. Remove all slag between weld passes and at completion.
10. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in horizontal, vertical and overhead positions on carbon steel plate is completed.

PROCESS

All performance elements for making groove weld in horizontal, vertical and overhead positions on carbon steel plate are critical and must be performed in sequence.

MAKE FILLET WELD IN FLAT POSITION ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make fillet weld in flat position on carbon steel plate.

PERFORMANCE CRITERIA

Fillet weld in flat position on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long fillet weld is placed on .25-inch (6 mm) thick carbon steel plate with an E7018 .12-inch (3 mm) diameter electrode in five minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMAW.
6. Make test weld on carbon steel plate.
7. Adjust parameters and electrode angles as necessary.
8. Complete weld as required by print.
9. Remove all slag between weld passes and at completion.
10. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in flat position on carbon steel plate is completed.

PROCESS

All performance elements for making fillet weld in flat position on carbon steel plate are critical and must be performed in sequence.

MAKE FILLET WELD IN HORIZONTAL, VERTICAL AND OVERHEAD POSITIONS ON CARBON STEEL PLATE.

IL.02.MFG.WC.27

SHIELDED METAL ARC WELDING (SMAW)

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make fillet weld in horizontal, vertical and overhead positions on carbon steel plate.

PERFORMANCE CRITERIA

Fillet weld in horizontal, vertical and overhead positions on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long fillet weld is placed on .25-inch (6 mm) thick carbon steel plate with an E7018 .12-inch (3 mm) diameter electrode in five minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMA welding (for the position selected).
6. Make test weld on carbon steel plate.
7. Adjust parameters and electrode angles as necessary.
8. Complete weld as required by print.
9. Remove all slag between weld passes and at completion.
10. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in horizontal, vertical and overhead positions on carbon steel plate is completed.

PROCESS

All performance elements for making fillet weld in horizontal, vertical and overhead positions on carbon steel plate are critical and must be performed in sequence.

MAKE GROOVE WELD IN FLAT POSITION ON STAINLESS STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make groove weld in flat position on stainless steel plate.

PERFORMANCE CRITERIA

Groove weld in flat position on stainless steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long square-groove weld is placed on .25-inch (6 mm) thick stainless steel plate with an E308 .12-inch (3mm) diameter electrode in five minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMA welding.
6. Make test weld on stainless steel plate.
7. Adjust parameters and electrode angles as necessary.
8. Complete weld as required by print.
9. Remove all slag between weld passes and at completion.
10. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in flat position on stainless steel plate is completed.

PROCESS

All performance elements for making groove weld in flat position on stainless steel plate are critical and must be performed in sequence.

MAKE GROOVE WELD IN HORIZONTAL, VERTICAL AND OVERHEAD POSITIONS ON STAINLESS STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make groove weld in horizontal, vertical and overhead positions on stainless steel plate.

PERFORMANCE CRITERIA

Groove weld in horizontal, vertical and overhead positions on stainless steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long square-groove weld is placed on .25-inch (6 mm) thick stainless steel plate with an E308 3/32-inch diameter electrode in ten minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMA welding (for the selected position).
6. Make test weld on stainless steel plate.
7. Monitor weld area temperature.
8. Adjust parameters and electrode angles as necessary.
9. Complete weld as required by print.
10. Remove all slag between weld passes and at completion.
11. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in horizontal, vertical and overhead positions on stainless steel plate is completed.

PROCESS

All performance elements for making groove weld in horizontal, vertical and overhead positions on stainless steel plate are critical and must be performed in sequence.

MAKE GROOVE WELD IN FLAT POSITION ON CARBON STEEL SHEET.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make groove weld in flat position on carbon steel sheet.

PERFORMANCE CRITERIA

Groove weld in flat position on carbon steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long square-groove weld with an E7018 .12-inch (3 mm) diameter electrode is placed on .18-inch (5 mm) thick carbon steel sheet in five minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMA welding.
6. Make test weld on carbon steel sheet.
7. Adjust parameters and electrode angles as necessary.
8. Complete weld as required by print.
9. Remove all slag between weld passes and at completion.
10. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in flat position on carbon steel sheet is completed.

PROCESS

All performance elements for making groove weld in flat position on carbon steel sheet are critical and must be performed in sequence.

MAKE FILLET WELD IN FLAT POSITION ON CARBON STEEL SHEET.

IL.02.MFG.WC.31

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make fillet weld in flat position on carbon steel sheet.

PERFORMANCE CRITERIA

Fillet weld in flat position on carbon steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long fillet weld with an E7018 .12-inch (3 mm) diameter electrode is placed on .18-inch (5 mm) thick carbon steel sheet in five minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMA welding.
6. Make test weld on carbon steel sheet.
7. Adjust parameters and electrode angles as necessary.
8. Complete weld as required by print.
9. Remove all slag between weld passes and at completion.
10. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in flat position on carbon steel sheet is completed.

PROCESS

All performance elements for making fillet weld in flat position on carbon steel sheet are critical and must be performed in sequence.

MAKE FILLET WELD IN HORIZONTAL, VERTICAL AND OVERHEAD POSITIONS ON CARBON STEEL SHEET.

IL.02.MFG.WC.32

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make fillet weld in horizontal, vertical and overhead positions on carbon steel sheet.

PERFORMANCE CRITERIA

Fillet weld in horizontal, vertical and overhead positions on carbon steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long fillet weld with an E7018 .12-inch (3 mm) diameter electrode is placed on .18-inch (5 mm) thick carbon steel sheet in five minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMA welding (for the position selected).
6. Make test weld on carbon steel sheet.
7. Adjust parameters and electrode angles as necessary.
8. Complete weld as required by print.
9. Remove all slag between weld passes and at completion.
10. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in horizontal, vertical and overhead positions on carbon steel sheet is completed.

PROCESS

All performance elements for making fillet weld in horizontal, vertical and overhead positions on carbon steel sheet are critical and must be performed in sequence.

MAKE GROOVE WELD IN ALL POSITIONS ON CARBON STEEL PIPE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) requirements
Environmental Protection Agency (EPA) requirements

WORK TO BE PERFORMED

Make groove weld in all positions on carbon steel pipe.

PERFORMANCE CRITERIA

Groove weld in all positions on carbon steel pipe is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A vee-groove weld with an E6010 and/or E7018 .12-inch (3 mm) electrode(s) is placed on 4-inch diameter schedule 40 carbon steel pipe in 30 minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode(s).
5. Adjust welding parameters for SMA welding (for the orientation of the pipe axis).
6. Make test weld on carbon steel pipe.
7. Adjust parameters and electrode angles as necessary.
8. Align pipe.
9. Complete weld as required by print.
10. Remove all slag between weld passes and at completion.
11. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in all positions on carbon steel pipe is completed.

PROCESS

All performance elements for making groove weld in all positions on carbon steel pipe are critical and must be performed in sequence.

MAKE FULL JOINT PENETRATION GROOVE WELD IN ALL POSITIONS ON CARBON STEEL PIPE.

IL.02.MFG.WC.34

SHIELDED METAL ARC WELDING (SMAW)

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Job specifications
Welding procedure or setup instructions
Welding system
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make full joint penetration groove weld in all positions on carbon steel pipe.

PERFORMANCE CRITERIA

Full joint penetration groove weld in all positions on carbon steel pipe is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A full penetration vee-groove weld is placed on 4-inch diameter schedule 40 carbon steel pipe in one hour.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Prepare joint for full penetration weld (e.g., groove angle, groove depth, root face, root opening).
5. Select the appropriate electrode.
6. Adjust welding parameters for SMA welding of the root (for the orientation of the pipe axis).
7. Make test weld on carbon steel pipe.
8. Adjust parameters and electrode angles as necessary.
9. Align pipe.
10. Make root weld.
11. Remove all slag. Grind as needed to assure the weld throat is consistent.
12. Inspect root weld; repair as needed. (Add stripper welds.)

13. Adjust welding parameters for SMA welding of fill welds as needed (for the orientation of the pipe axis).
14. Make fill welds as needed.
15. Remove all slag. Grind as needed to assure the weld throat is consistent.
16. Inspect fill weld(s); repair as needed. (Add stripper welds.)
17. Adjust welding parameters for SMA welding of the cover (cap) weld (for the orientation of the pipe axis).
18. Make cover (cap) weld.
19. Remove all slag.
20. Inspect cover (cap) weld; repair as needed. (Add stripper welds.)
21. Complete weld as required by print.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Full joint penetration groove weld in all positions on carbon steel pipe is completed.

PROCESS

All performance elements for making full joint penetration groove weld in all positions on carbon steel pipe are critical and must be performed in sequence.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make weld in all positions on carbon steel process equipment.

PERFORMANCE CRITERIA

Weld in all positions on carbon steel process equipment is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 8-inch vee-groove weld with a .38 (10 mm) throat is placed on a carbon steel machine frame in ten minutes or less.)

PERFORMANCE ELEMENTS

Note: The purpose of this standard is to simulate making a maintenance weld on equipment in position and not on a benchtop. (See Appendix A for sketch.)

1. Put on PPE.
2. Review the print weld placement or repair location.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMA welding (for the orientation of the joint on the process equipment).
6. Make test weld on carbon steel plate.
7. Adjust parameters and electrode angles as necessary.
8. Align process equipment parts as necessary.
9. Prepare joint as required.
10. Complete weld as required by print or job instructions.
11. Remove all slag between weld passes and at completion.
12. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Weld in all positions on carbon steel process equipment is completed.

PROCESS

All performance elements for making weld in all positions on carbon steel process equipment are critical and must be performed in sequence.

MAKE WELD IN ALL POSITIONS ON CAST IRON PROCESS EQUIPMENT.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make weld in all positions on cast iron process equipment.

PERFORMANCE CRITERIA

Weld in all positions on cast iron process equipment is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 6-inch vee-groove weld is placed on cast iron machine frame in 45 minutes.)

PERFORMANCE ELEMENTS

Note: *The purpose of this standard is to simulate making a maintenance weld on equipment in position and not on a benchtop. (See Appendix B for sketch.)*

1. Put on PPE.
2. Review the print weld placement or repair location.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMA welding (for the orientation of the joint on the process equipment).
6. Make test weld on cast iron.
7. Adjust parameters and electrode angles as necessary.
8. Align process equipment parts as necessary.
9. Prepare the joint as required.
10. Monitor temperature.
11. Complete weld as required by print or job instructions.
12. Remove all slag between weld passes and at completion.
13. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Weld in all positions on cast iron process equipment is completed.

PROCESS

All performance elements for making weld in all positions on cast iron process equipment are critical and must be performed in sequence.

MAKE GROOVE WELD IN ALL POSITIONS ON STAINLESS STEEL SHEET.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in all positions on stainless steel sheet.

PERFORMANCE CRITERIA

Groove weld in all positions on stainless steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long square-groove weld with an E308 3/32-inch diameter electrode is placed on .12-inch (3 mm) thick stainless steel sheet in five minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMA welding (for the position selected).
6. Make test weld on stainless steel sheet.
7. Adjust parameters and electrode angles as necessary.
8. Complete weld as required by print.
9. Remove all slag between weld passes and at completion.
10. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in all positions on stainless steel sheet is completed.

PROCESS

All performance elements for making groove weld in all positions on stainless steel sheet are critical and must be performed in sequence.

MAKE FILLET WELD IN ALL POSITIONS ON STAINLESS STEEL SHEET.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Problem definition
Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make fillet weld in all positions on stainless steel sheet.

PERFORMANCE CRITERIA

Fillet weld in all positions on stainless steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long fillet weld with an E308 3/32-inch diameter electrode is placed on .12-inch (3 mm) thick stainless steel sheet in five minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMA welding (for the position selected).
6. Make test weld on stainless steel sheet.
7. Adjust parameters and electrode angles as necessary.
8. Complete weld as required by print.
9. Remove all slag between weld passes and at completion.
10. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in all positions on stainless steel sheet is completed.

PROCESS

All performance elements for making fillet weld in all positions on stainless steel sheet are critical and must be performed in sequence.

MAKE GROOVE WELD IN ALL POSITIONS ON STAINLESS STEEL PIPE.

IL.02.MFG.WC.39

SHIELDED METAL ARC WELDING (SMAW)

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in all positions on stainless steel pipe.

PERFORMANCE CRITERIA

Groove weld in all positions on stainless steel pipe is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A groove weld is placed on 4-inch diameter schedule 40 stainless steel pipe with an E308 .12-inch (3mm) diameter electrode in one hour or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Select the appropriate electrode.
5. Adjust welding parameters for SMA welding (for the orientation of the pipe axis).
6. Make test weld on stainless steel pipe.
7. Adjust parameters and electrode angles as necessary.
8. Align pipe.
9. Complete weld as required by print.
10. Remove all slag between weld passes and at completion.
11. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in all positions on stainless steel pipe is completed.

PROCESS

All performance elements for making groove weld in all positions on stainless steel pipe are critical and must be performed in sequence.

MAKE FULL JOINT PENETRATION GROOVE WELD IN ALL POSITIONS ON STAINLESS STEEL PIPE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Job specifications
Welding procedure or setup instructions
Welding system
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make full joint penetration groove weld in all positions on stainless steel pipe.

PERFORMANCE CRITERIA

Full joint penetration groove weld in all positions on stainless steel pipe is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A vee-groove weld is placed on 4-inch diameter schedule 40 stainless steel pipe in one hour or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Prepare joint for full penetration weld (e.g., groove angle, groove depth, root face, root opening).
5. Select the appropriate electrode.
6. Adjust welding parameters for SMA welding of the root (for the orientation of the pipe axis).
7. Make test weld on stainless steel pipe.
8. Adjust parameters and electrode angles as necessary.
9. Align pipe.
10. Make root weld.
11. Remove all slag. Grind as needed to assure the weld throat is consistent.
12. Inspect root weld; repair as needed. (Add stripper welds.)

13. Adjust welding parameters for SMA welding of fill welds as needed (for the orientation of the pipe axis).
14. Make fill welds as needed.
15. Remove all slag. Grind as needed to assure the weld throat is consistent.
16. Inspect fill weld(s); repair as needed. (Add stripper welds.)
17. Adjust welding parameters for SMA welding of the cover (cap) weld (for the orientation of the pipe axis).
18. Make cover (cap) weld.
19. Remove all slag.
20. Inspect cover (cap) weld; repair as needed. (Add stripper welds.)
21. Complete weld as required by print.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Full joint penetration groove weld in all positions on stainless steel pipe is completed.

PROCESS

All performance elements for making full joint penetration groove weld in all positions on stainless steel pipe are critical and must be performed in sequence.

MAKE FILLET WELD IN FLAT POSITION USING SPRAY TRANSFER ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make fillet weld in flat position using spray transfer on carbon steel plate.

PERFORMANCE CRITERIA

Fillet weld in flat position using spray transfer on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long .25-inch (6 mm) fillet weld is placed on .25-inch (6 mm) thick carbon steel plate in one minute or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for spray GMA welding transfer.
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in flat position using spray transfer on carbon steel plate is completed.

PROCESS

All performance elements for making fillet weld in flat position using spray transfer on carbon steel plate are critical and must be performed in sequence.

MAKE FILLET WELD IN HORIZONTAL AND VERTICAL (DOWN) POSITIONS USING SPRAY TRANSFER ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make fillet weld in horizontal and vertical (down) positions using spray transfer on carbon steel plate.

PERFORMANCE CRITERIA

Fillet weld in horizontal and vertical (down) positions using spray transfer on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 12-inch long .25-inch (6 mm) fillet weld is placed on .25-inch (6 mm) thick carbon steel plate in one minute or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for spray GMA welding transfer (in the selected position).
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip. Replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in horizontal and vertical (down) positions using spray transfer on carbon steel plate is completed.

PROCESS

All performance elements for making fillet weld in horizontal and vertical (down) positions using spray transfer on carbon steel plate are critical and must be performed in sequence.

MAKE FILLET WELD IN FLAT POSITION USING SHORT CIRCUIT TRANSFER ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make fillet weld in flat position using short circuit transfer on carbon steel plate.

PERFORMANCE CRITERIA

Fillet weld in flat position using short circuit transfer on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long .25-inch (6 mm) fillet weld is placed on .25-inch (6 mm) thick carbon steel plate in two minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for short circuit GMA welding transfer.
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in flat position using short circuit transfer on carbon steel plate is completed.

PROCESS

All performance elements for making fillet weld in flat position using short circuit transfer on carbon steel plate are critical and must be performed in sequence.

MAKE FILLET WELD IN HORIZONTAL, VERTICAL (UP AND DOWN) AND OVERHEAD POSITIONS USING SHORT CIRCUIT TRANSFER ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make fillet weld in horizontal, vertical (up and down) and overhead positions using short circuit transfer on carbon steel plate.

PERFORMANCE CRITERIA

Fillet weld in horizontal, vertical (up and down) and overhead positions using short circuit transfer on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 12-inch long .25-inch (6 mm) fillet weld is placed on .25-inch (6 mm) thick carbon steel plate in two minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for short circuit GMA welding transfer (in the selected position).
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in horizontal, vertical (up and down) and overhead positions using short circuit transfer on carbon steel plate is completed.

PROCESS

All performance elements for making fillet weld in horizontal, vertical (up and down) and overhead positions using short circuit transfer on carbon steel plate are critical and must be performed in sequence.

MAKE GROOVE WELD IN FLAT POSITION USING SPRAY TRANSFER ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in flat position using spray transfer on carbon steel plate.

PERFORMANCE CRITERIA

Groove weld in flat position using spray transfer on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long groove weld is placed on .25-inch (6 mm) thick carbon steel plate in one minute or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for spray GMA welding transfer.
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in flat position using spray transfer on carbon steel plate is completed.

PROCESS

All performance elements for making groove weld in flat position using spray transfer on carbon steel plate are critical and must be performed in sequence.

MAKE MULTIPLE PASS FILLET WELD IN FLAT POSITION USING SPRAY TRANSFER ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make multiple pass fillet weld in flat position using spray transfer on carbon steel plate.

PERFORMANCE CRITERIA

Multiple pass fillet weld in flat position using spray transfer on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long .50-inch (13 mm) equal leg fillet weld is placed on 50-inch (13 mm) thick carbon steel plate tee joint in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for spray GMA welding transfer.
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
    a. Remove spatter and foreign material from nozzle.
    b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete root pass as required by print.
10. Inspect root pass.
11. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Multiple pass fillet weld in flat position using spray transfer on carbon steel plate is completed.

PROCESS

All performance elements for making a multiple pass fillet weld in flat position using spray transfer on carbon steel plate are critical and must be performed in sequence.

MAKE GROOVE WELD IN HORIZONTAL AND VERTICAL (DOWN) POSITIONS USING SPRAY TRANSFER ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in horizontal and vertical (down) positions using spray transfer on carbon steel plate.

PERFORMANCE CRITERIA

Groove weld in horizontal and vertical (down) positions using spray transfer on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 16-inch long groove weld is placed on .25-inch (6 mm) thick carbon steel plate in two minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for spray GMA welding transfer (in the selected position).
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in horizontal and vertical (down) positions using spray transfer on carbon steel plate is completed.

PROCESS

All performance elements for making groove weld in horizontal and vertical (down) positions using spray transfer on carbon steel plate are critical and must be performed in sequence.

MAKE GROOVE WELD IN FLAT POSITION USING SHORT CIRCUIT TRANSFER ON CARBON STEEL PLATE.

IL.02.MFG.WC.48

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in flat position using short circuit transfer on carbon steel plate.

PERFORMANCE CRITERIA

Groove weld in flat position using short circuit transfer on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 16-inch long groove weld is placed on .25-inch (6 mm) thick carbon steel plate in two minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for short circuit GMA welding transfer.
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in flat position using short circuit transfer on carbon steel plate is completed.

PROCESS

All performance elements for making groove weld in flat position using short circuit transfer on carbon steel plate are critical and must be performed in sequence.

MAKE MULTIPLE PASS FILLET WELD IN FLAT POSITION USING SHORT CIRCUIT TRANSFER ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make multiple pass fillet weld in flat position using short circuit transfer on carbon steel plate.

PERFORMANCE CRITERIA

Multiple pass fillet weld in flat position using short circuit transfer on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long .50-inch (13 mm) equal leg fillet weld is placed on 50-inch (13 mm) thick carbon steel plate tee joint in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for short circuit GMA welding transfer.
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete root pass as required by print.
10. Inspect root pass.
11. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Multiple pass fillet weld in flat position using short circuit transfer on carbon steel plate is completed.

PROCESS

All performance elements for making multiple pass fillet weld in flat position using short circuit transfer on carbon steel plate are critical and must be performed in sequence.

MAKE GROOVE WELD IN HORIZONTAL, VERTICAL (UP AND DOWN) AND OVERHEAD POSITONS USING SHORT CIRCUIT TRANSFER ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in horizontal, vertical (up and down) and overhead positions using short circuit transfer on carbon steel plate.

PERFORMANCE CRITERIA

Groove weld in the horizontal, vertical (up and down) and overhead positions using short circuit transfer on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 16-inch long groove weld is placed on .25-inch (6 mm) thick carbon steel plate in two minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for short circuit GMA welding transfer (in the selected position).
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in horizontal, vertical (up and down) and overhead positions using short circuit transfer on carbon steel plate is completed.

PROCESS

All performance elements for making groove weld in horizontal, vertical (up and down) and overhead positions using short circuit transfer on carbon steel plate are critical and must be performed in sequence.

MAKE GROOVE WELD IN ALL POSITIONS ON CARBON STEEL SHEET.

IL.02.MFG.WC.51

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in all positions on carbon steel sheet.

PERFORMANCE CRITERIA

Groove weld in all positions on carbon steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long groove weld is placed on .18-inch (5 mm) thick carbon steel sheet in two minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for gas shielded FCA welding (in the selected position).
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel sheet.
8. Adjust parameters and gun angles as necessary.
9. Complete and inspect weld.
10. Remove all slag between weld passes.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in all positions on carbon steel sheet is completed.

PROCESS

All performance elements for making groove weld in all positions on carbon steel sheet are critical and must be performed in sequence.

MAKE FILLET WELD IN ALL POSITIONS ON CARBON STEEL SHEET.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make fillet weld in all positions on carbon steel sheet.

PERFORMANCE CRITERIA

Fillet weld in all positions on carbon steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long fillet weld is placed on .18-inch (5 mm) thick carbon steel sheet in two minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for gas shielded FCA welding (in the selected position).
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
    a. Remove spatter and foreign material from nozzle.
    b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel sheet.
8. Adjust parameters and gun angles as necessary.
9. Complete and inspect weld.
10. Remove all slag between weld passes.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in all positions on carbon steel sheet is completed.

PROCESS

All performance elements for making fillet weld in all positions on carbon steel sheet are critical and must be performed in sequence.

MAKE GROOVE WELD IN HORIZONTAL, VERTICAL (UP AND DOWN) AND OVERHEAD POSITIONS ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in horizontal, vertical (up and down) and overhead positions on carbon steel plate.

PERFORMANCE CRITERIA

Groove weld in horizontal, vertical (up and down) and overhead positions on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long groove weld is placed on .38-inch (10 mm) thick carbon steel plate in five minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for gas shielded FCA welding (in the selected position).
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete and inspect weld.
10. Remove all slag between weld passes.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in horizontal, vertical (up and down) and overhead positions on carbon steel plate is completed.

PROCESS

All performance elements for making groove weld in horizontal, vertical (up and down) and overhead positions on carbon steel plate are critical and must be performed in sequence.

MAKE VEE-GROOVE WELD IN FLAT POSITION ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make vee-groove weld in flat position on carbon steel plate.

PERFORMANCE CRITERIA

Vee-groove weld in flat position on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long .38-inch (10 mm) closed root vee-groove weld is placed on .50-inch (13 mm) thick carbon steel plate in ten minutes.

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for gas shielded FCA welding.
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
    a. Remove spatter and foreign material from nozzle.
    b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete root weld (pass).
10. Remove all slag.
11. Inspect root weld; grind as necessary.
12. Adjust weld parameters as necessary for fill weld(s) (passes).

13. Inspect welding gun assembly.
    a. Remove spatter and foreign material from nozzle.
    b. Inspect contact tip; replace as necessary.
14. Complete fill weld(s) (passes).
15. Remove slag between welds.
16. Inspect fill welds.
17. Complete repair (stripper) welds for consistent buildup; grind as necessary.
18. Adjust weld parameters as necessary for cover weld(s) (passes).
19. Inspect welding gun assembly.
    a. Remove spatter and foreign material from nozzle.
    b. Inspect contact tip; replace as necessary.
20. Complete cover weld(s) (passes).
21. Remove slag between welds.
22. Inspect cover welds.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Vee-groove weld in flat position on carbon steel plate is completed.

PROCESS

All performance elements for making vee-groove weld in flat position on carbon steel plate are critical and must be performed in sequence.

MAKE GROOVE WELD IN FLAT POSITION ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in flat position on carbon steel plate.

PERFORMANCE CRITERIA

Groove weld in flat position on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long groove weld is placed on .38-inch (10 mm) thick carbon steel plate in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for gas shielded FCA welding in the flat position.
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete weld.
10. Remove all slag between weld passes.
11. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in flat position on carbon steel plate is completed.

PROCESS

All performance elements for making groove weld in flat position on carbon steel plate are critical and must be performed in sequence.

MAKE FILLET WELD IN HORIZONTAL, VERTICAL (UP AND DOWN) AND OVERHEAD POSITIONS ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make fillet weld in horizontal, vertical (up and down) and overhead positions on carbon steel plate.

PERFORMANCE CRITERIA

Fillet weld in horizontal, vertical (up and down) and overhead positions on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long fillet weld is placed on .38-inch (10 mm) thick carbon steel plate in five minutes or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for gas shielded FCA welding (in the selected position).
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete and inspect weld.
10. Remove all slag between weld passes.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in horizontal, vertical (up and down) and overhead positions on carbon steel plate is completed.

PROCESS

All performance elements for making fillet weld in horizontal, vertical (up and down) and overhead positions on carbon steel plate are critical and must be performed in sequence.

MAKE MULTIPLE PASS FILLET WELD IN FLAT AND HORIZONTAL POSITIONS ON CARBON STEEL PLATE.

IL.02.MFG.WC.57

FLUX CORE ARC WELDING (FCAW)

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make multiple pass fillet weld in flat and horizontal positions on carbon steel plate.

PERFORMANCE CRITERIA

Multiple pass fillet weld in flat and horizontal positions on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 16-inch long .38-inch (10 mm) equal legged multiple pass fillet weld in horizontal position is placed on .50-inch (13 mm) thick carbon steel plate in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for gas shielded FCA welding.
5. Set correct shielding gas flow.
6. Inspect welding gun assembly.
    a. Remove spatter and foreign material from nozzle.
    b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete root weld (pass).
10. Remove all slag.
11. Inspect root weld; grind as necessary.

12. Adjust weld parameters as necessary for fill weld(s) (passes).
13. Inspect welding gun assembly.
    a. Remove spatter and foreign material from nozzle.
    b. Inspect contact tip; replace as necessary.
14. Complete fill weld(s) (passes) beginning at bottom toe of root pass.
15. Remove slag between welds.
16. Inspect fill welds.
17. Adjust weld parameters as necessary for cover weld(s) (passes).
18. Inspect welding gun assembly.
    a. Remove spatter and foreign material from nozzle.
    b. Inspect contact tip, replace as necessary.
19. Complete cover weld(s) (passes).
20. Remove slag between welds.
21. Inspect cover welds.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Multiple pass fillet weld in flat and horizontal positions on carbon steel plate is completed.

PROCESS

All performance elements for making multiple pass fillet weld in the flat and horizontal positions on carbon steel plate are critical and must be performed in sequence.

MAKE VEE-GROOVE WELD IN FLAT POSITION ON CARBON STEEL PLATE.

IL.02.MFG.WC.58

SUBMERGED ARC WELDING (SAW)

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make vee-groove weld in flat position on carbon steel plate.

PERFORMANCE CRITERIA

Vee-groove weld in flat position on carbon steel plate is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long vee-groove closed root weld is placed on .38-inch (10 mm) thick carbon steel plate in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for submerged arc welding (in the selected position).
5. Select correct flux and fill the flux hopper.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete weld.
10. Remove all slag and flux between weld passes.
11. Reclaim flux as necessary.
12. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Vee-groove weld in flat position on carbon steel plate is completed.

PROCESS

All performance elements for making vee-groove weld in flat position on carbon steel plate are critical and must be performed in sequence.

MAKE FILLET WELD IN FLAT AND HORIZONTAL POSITIONS ON CARBON STEEL PLATE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make fillet weld in flat and horizontal positions on carbon steel plate.

PERFORMANCE CRITERIA

Fillet weld in flat and horizontal positions on carbon steel plate are completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: An 18-inch long fillet weld in the horizontal position is placed on .50-inch (13 mm) thick carbon steel plate in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for submerged arc welding in the selected position.
5. Select correct flux and fill the flux hopper.
6. Inspect welding gun assembly.
   a. Remove spatter and foreign material from nozzle.
   b. Inspect contact tip; replace as necessary.
7. Make test weld on carbon steel plate.
8. Adjust parameters and gun angles as necessary.
9. Complete weld.
10. Remove all slag and flux between weld passes.
11. Reclaim flux as directed by company procedures.
12. Inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in flat and horizontal positions on carbon steel plate is completed.

PROCESS

All performance elements for making fillet weld in flat and horizontal positions on carbon steel plate are critical and must be performed in sequence.

MAKE GROOVE WELD IN FLAT POSITION ON CARBON STEEL SHEET.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in flat position on carbon steel sheet.

PERFORMANCE CRITERIA

Groove weld in flat position on carbon steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 10-inch long groove weld is placed on .12-inch (3 mm) thick carbon steel sheet in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for carbon steel sheet.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
    a. Remove foreign material from the ceramic cup.
    b. Inspect electrode; grind as necessary.
    c. Assemble or adjust torch for correct electrode extension.
7. Make test weld on carbon steel sheet.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in flat position on carbon steel sheet is completed.

PROCESS

All performance elements for making groove weld in flat position on carbon steel sheet are critical and must be performed in sequence.

MAKE GROOVE WELD IN HORIZONTAL, VERTICAL AND OVERHEAD POSITIONS ON CARBON STEEL SHEET.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in horizontal, vertical and overhead positions on carbon steel sheet.

PERFORMANCE CRITERIA

Groove weld in horizontal, vertical and overhead positions on carbon steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 10-inch long groove weld is placed on .12-inch (3 mm) thick carbon steel sheet in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for carbon steel sheet.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
   a. Remove foreign material from ceramic cup.
   b. Inspect electrode; grind as necessary.
   c. Assemble adjust torch for correct electrode extension.
7. Make test weld on carbon steel sheet.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in horizontal, vertical and overhead positions on carbon steel sheet is completed.

PROCESS

All performance elements for making groove weld in horizontal, vertical and overhead positions on carbon steel sheet are critical and must be performed in sequence.

MAKE FILLET WELD IN FLAT POSITION ON CARBON STEEL SHEET.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make fillet weld in flat position on carbon steel sheet.

PERFORMANCE CRITERIA

Fillet weld in flat position on carbon steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 10-inch long single pass fillet weld is placed on .12-inch (3 mm) thick carbon steel sheet in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for carbon steel sheet.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
    a. Remove foreign material from ceramic cup.
    b. Inspect electrode; grind as necessary.
    c. Assemble or adjust torch for correct electrode extension.
7. Make test weld on carbon steel sheet.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in flat position on carbon steel sheet is completed.

PROCESS

All performance elements for making fillet weld in flat position on carbon steel sheet are critical and must be performed in sequence.

MAKE FILLET WELD IN HORIZONTAL, VERTICAL AND OVERHEAD POSITIONS ON CARBON STEEL SHEET.

IL.02.MFG.WC.63

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make fillet weld in horizontal, vertical and overhead positions on carbon steel sheet.

PERFORMANCE CRITERIA

Fillet weld in horizontal, vertical and overhead positions on carbon steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 10-inch long single pass fillet weld is placed on .12-inch (3 mm) thick carbon steel sheet in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for carbon steel sheet.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
   a. Remove foreign material from the ceramic cup.
   b. Inspect electrode; grind as necessary.
   c. Assemble or adjust torch for correct electrode extension.
7. Make test weld on carbon steel sheet.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in horizontal, vertical, and overhead positions on carbon steel sheet is completed.

PROCESS

All performance elements for making fillet weld in horizontal, vertical and overhead positions on carbon steel sheet are critical and must be performed in sequence.

MAKE GROOVE WELD ON CARBON STEEL TUBE.

IL.02.MFG.WC.64

GAS TUNGSTEN ARC WELDING (GTAW)

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld on carbon steel tube.

PERFORMANCE CRITERIA

Groove weld on carbon steel tube is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A square groove weld is placed on 2-inch diameter .156-inch thick carbon steel tube in ten minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for carbon steel tube.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
   a. Remove foreign material from the ceramic cup.
   b. Inspect electrode; grind as necessary.
   c. Assemble or adjust torch for correct electrode extension.
7. Make test weld on carbon steel tube.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Align tube.
11. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld on carbon steel tube is completed.

PROCESS

All performance elements for making groove weld on carbon steel tube are critical and must be performed in sequence.

MAKE VEE-GROOVE WELD ON CARBON STEEL PIPE.

IL.02.MFG.WC.65

GAS TUNGSTEN ARC WELDING (GTAW)

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make vee-groove weld on carbon steel pipe.

PERFORMANCE CRITERIA

Vee-groove weld on carbon steel pipe is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A closed root vee-groove weld is placed on 3-inch diameter schedule 40 carbon steel pipe in 45 minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for carbon steel pipe.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
   a. Remove foreign material from the ceramic cup.
   b. Inspect electrode; grind as necessary.
   c. Assemble or adjust torch for correct electrode extension.
7. Make test weld on carbon steel pipe.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Check joint preparation; adjust as necessary.
11. Align pipe and tack weld.
12. Check alignment; adjust as necessary.
13. Complete tack welds.
14. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Vee-groove weld on carbon steel pipe is completed.

PROCESS

All performance elements for making vee-groove weld on carbon steel pipe are critical and must be performed in sequence.

MAKE GROOVE WELD IN FLAT POSITION ON STAINLESS STEEL SHEET.

IL.02.MFG.WC.66

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in flat position on stainless steel sheet.

PERFORMANCE CRITERIA

Groove weld in flat position on stainless steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 10-inch long groove weld is placed on .12-inch (3 mm) thick stainless steel sheet in ten minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for stainless steel sheet.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
    a. Remove foreign material from ceramic cup.
    b. Inspect electrode; grind as necessary.
    c. Assemble or adjust torch for correct electrode extension.
7. Make test weld on stainless steel sheet.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in flat position on stainless steel sheet is completed.

PROCESS

All performance elements for making groove weld in flat position on stainless steel sheet are critical and must be performed in sequence.

MAKE GROOVE WELD IN HORIZONTAL AND VERTICAL POSITIONS ON STAINLESS STEEL SHEET.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Personal protective equipment (PPE)
- Standard part print
- Job specifications
- Welding equipment and manuals
- Standard tool kit
- Company, local or national welding codes
- Occupational Safety and Health Administration (OSHA) guidelines
- Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in horizontal and vertical positions on stainless steel sheet.

PERFORMANCE CRITERIA

Groove weld in horizontal and vertical positions on stainless steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 10-inch long groove weld is placed on .12-inch (3 mm) thick stainless steel sheet in ten minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for stainless steel sheet.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
    a. Remove foreign material from ceramic cup.
    b. Inspect electrode; grind as necessary.
    c. Assemble or adjust torch for correct electrode extension.
7. Make test weld on stainless steel sheet.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in the horizontal and vertical positions on stainless steel sheet is completed.

PROCESS

All performance elements for making groove weld in horizontal and vertical positions on stainless steel sheet are critical and must be performed in sequence.

MAKE FILLET WELD IN FLAT POSITION ON STAINLESS STEEL SHEET.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make fillet weld in flat position on stainless steel sheet.

PERFORMANCE CRITERIA

Fillet weld in flat position on stainless steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 10-inch long single pass fillet weld is placed on .12-inch (3 mm) thick stainless steel sheet in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for stainless steel sheet.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
   a. Remove foreign material from ceramic cup.
   b. Inspect electrode; grind as necessary.
   c. Assemble or adjust torch for correct electrode extension.
7. Make test weld on stainless steel sheet.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in the flat position on stainless steel sheet is completed.

PROCESS

All performance elements for making fillet weld in flat position on stainless steel sheet are critical and must be performed in sequence.

MAKE FILLET WELD IN HORIZONTAL AND VERTICAL POSITIONS ON STAINLESS STEEL SHEET.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make fillet weld in horizontal and vertical positions on stainless steel sheet.

PERFORMANCE CRITERIA

Fillet weld in horizontal and vertical positions on stainless steel sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 10-inch long single pass fillet weld is placed on .12-inch (3 mm) thick stainless steel sheet in ten minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for stainless steel sheet.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
   a. Remove foreign material from ceramic cup.
   b. Inspect electrode; grind as necessary.
   c. Assemble or adjust torch for correct electrode extension.
7. Make test weld on stainless steel sheet.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in horizontal and vertical positions on stainless steel sheet is completed.

PROCESS

All performance elements for making fillet weld in horizontal and vertical positions on stainless steel sheet are critical and must be performed in sequence.

MAKE GROOVE WELD ON STAINLESS STEEL TUBE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld on stainless steel tube.

PERFORMANCE CRITERIA

Groove weld on stainless steel tube is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A square groove weld is placed on 2-inch diameter .109-inch thick stainless steel tube in ten minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for stainless steel tube.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
   a. Remove foreign material from ceramic cup.
   b. Inspect electrode; grind as necessary.
   c. Assemble or adjust torch for correct electrode extension.
7. Make test weld on stainless steel tube.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Align tube.
11. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld on stainless steel tube is completed.

PROCESS

All performance elements for making groove weld on stainless steel tube are critical and must be performed in sequence.

MAKE VEE-GROOVE WELD ON STAINLESS STEEL PIPE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make vee-groove weld on stainless steel pipe.

PERFORMANCE CRITERIA

Vee-groove weld on stainless steel pipe is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A closed root vee-groove weld is placed on 2-inch diameter schedule 40 stainless steel pipe in 30 minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for stainless steel pipe.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
   a. Remove foreign material from ceramic cup.
   b. Inspect electrode; grind as necessary.
   c. Assemble or adjust torch for correct electrode extension.
7. Make test weld on stainless steel pipe.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Check joint preparation. Adjust as necessary.
11. Align pipe and tack weld.
12. Check alignment; adjust as necessary.
13. Complete tack welds.
14. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Vee-groove weld on stainless steel pipe is completed.

PROCESS

All performance elements for making vee-groove weld on stainless steel pipe are critical and must be performed in sequence.

MAKE GROOVE WELD IN FLAT POSITION ON ALUMINUM SHEET.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make groove weld in flat position on aluminum sheet.

PERFORMANCE CRITERIA

Groove weld in flat position on aluminum sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 10-inch long groove weld is placed on .18-inch (5 mm) thick aluminum sheet in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for aluminum sheet.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
    a. Remove foreign material from ceramic cup.
    b. Inspect electrode; grind as necessary.
    c. Assemble or adjust torch for correct electrode extension.
7. Make test weld on aluminum sheet.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Groove weld in flat position on aluminum sheet is completed.

PROCESS

All performance elements for making groove weld in flat position on aluminum sheet are critical and must be performed in sequence.

MAKE FILLET WELD IN FLAT POSITION ON ALUMINUM SHEET.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment and manuals
Standard tool kit
Company, local or national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make fillet weld in flat position on aluminum sheet.

PERFORMANCE CRITERIA

Fillet weld in flat position on aluminum sheet is completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 10-inch long single pass fillet weld is placed on .18-inch (5 mm) thick aluminum sheet in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review print weld placement.
3. Inspect work area for safety hazards.
4. Adjust welding parameters for aluminum sheet.
5. Set correct shielding gas flow.
6. Inspect welding torch assembly.
   a. Remove foreign material from ceramic cup.
   b. Inspect electrode; grind as necessary.
   c. Assemble or adjust torch for correct electrode extension.
7. Make test weld on aluminum sheet.
8. Adjust parameters, torch angle and filler metal deposit as necessary.
9. Clean base material as needed.
10. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Fillet weld in flat position on aluminum sheet is completed.

PROCESS

All performance elements for making fillet weld in flat position on aluminum sheet are critical and must be performed in sequence.

MAKE SURFACE WELDS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding equipment
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Make surface welds.

PERFORMANCE CRITERIA

Surface welds are completed according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the job specifications.

(Example: A 6-inch by 6-inch uniform single layer on .38-inch (10 mm) thick carbon steel plate is surfaced in one hour or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print weld placement or equipment manual for original size of worn area.
3. Inspect work area for safety hazards.
4. Select the appropriate welding buildup electrode and surface electrode.
5. Select the appropriate welding process.
6. Adjust welding parameters for the welding process and electrode selected (in the selected position).
7. Make test welds.
8. Adjust parameters and gun or electrode angles as necessary.
9. Build up area in the pattern required.
10. Remove all slag and flux between weld passes.
11. Complete and inspect weld.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Surface welds are completed.

PROCESS

All performance elements for making surface welds are critical and must be performed in sequence.

INSPECT WELDS FOR VISUAL DISCONTINUITIES.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Job specifications
Completed welds
Conversion tables
Standard tool kit
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Inspect completed welds for visual discontinuities.

PERFORMANCE CRITERIA

Completed welds are inspected for visual discontinuities according to acceptance criteria (Appendix C), standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the number and length of completed welds and job specifications.

(Example: Fifty linear inches of fillet welds on carbon steel plate are inspected in 15 minutes.)

PERFORMANCE ELEMENTS

Note: For inspection it is assumed the inspector has good eye health with a near visual acuity with or without corrective lenses capable of passing examination on Snelling English or equivalent at 12 inches; and far vision acuity of 20/40 or better.

1. Put on PPE.
2. Review the print, weld standard, national welding code or company specifications.
3. Gather reference material and conversion tables as needed.
4. Gather inspection tools as needed.
5. Inspect work area for safety hazards.
6. Use predetermined company inspection standard or determine a convenient linear unit for inspection.

7. Inspect each linear unit for visual discontinuities per standard.
8. Measure reinforcement, leg size and discontinuities as needed.
9. Record findings per required weld standard, national welding code or company specifications.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Completed welds are inspected for visual discontinuities.

PROCESS

All performance elements for inspection of completed welds for visual discontinuities are critical and must be performed in sequence.

COMPLETE REQUIRED QUALITY ASSURANCE DOCUMENTATION.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Job specifications
Company quality assurance documentation
Conversion tables
Company policy and procedures
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Complete required quality assurance documentation.

PERFORMANCE CRITERIA

Required quality assurance documentation is completed according to company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the number and length of completed welds and job specifications.

(Example: Quality assurance documentation for 50 linear inches of weld is completed in 15 minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print, weld standard, national welding code or company specifications.
3. Gather the appropriate quality assurance documentation.
4. Gather reference material and conversion tables as needed.
5. Fill in supplementary information such as date, part number, print number, welding process, machine number, operator or operator number and lot number.
6. Enter variable data, attribute data, measurements, locations and go/no go information.
7. Check accuracy and completeness of information.
8. Submit documentation to supervisor, quality assurance manager or appropriate personnel.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Quality assurance documentation is completed.

PROCESS

All performance elements for completing quality assurance documentation are critical and must be performed in sequence.

IDENTIFY MATERIALS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Bench or offset grinder
Purchase order, packing slip or work order for color code information
Standard material color code
Company quality assurance documentation
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Identify materials for processing or storage.

PERFORMANCE CRITERIA

Identify materials per color code or spark test.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the number and length of completed welds and job specifications.

(Example: Ten color coded carbon steel plates are identified in five minutes or five steel parts are spark tested and identified in five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the company or steel service color code.
3. Gather reference material.
4. Review purchase order, packing slip, or work order for color code information.
5. Locate a bench or offset grinder for use during the spark test if color code information is not available.
6. Look for the color code on the edge of plate material, stenciled numbers on the part or etched or forged markings.
7. Prepare for a spark test by locating safety equipment, grinder and reference material if no markings are found.
8. Spark test the material.
9. Identify and label the material from the results of the color code markings.
10. Document the identification on the appropriate quality assurance forms.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Materials are identified for processing or storage.

PROCESS

All performance elements for identifying materials are critical and must be performed in sequence.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Welded part, subassembly or welding process
Standard part print
Job specifications
Conversion tables
Company quality assurance documentation
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Sketch revisions for weld size and placement.

PERFORMANCE CRITERIA

Revisions for weld size and placement are sketched according to company specifications.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the number of revisions required.

(Example: Weld revisions are sketched on a standard print for three welds in ten minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print, weld standard, national welding code or company specifications.
3. Check the welded part, subassembly or process.
4. Gather reference material and conversion tables as needed.
5. Determine the revised weld size and placement.
6. Using standard drafting practice and standard welding symbols, sketch the revisions on the part print or revision sketch.
7. Add all supplementary information to the views and welding symbols such as dimensions, tolerance and joint preparation requirements.
8. Check accuracy and completeness of information.
9. Submit sketch to appropriate personnel.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Revision sketch for weld size and placement are completed.

PROCESS

All performance elements for sketching revisions for weld size and placement are critical and must be performed in sequence.

DEVELOP WELDING PROCEDURES.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Job specifications
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Develop welding procedures.

PERFORMANCE CRITERIA

Welding procedures are developed according to company specifications or local and national welding codes.

Skill is performed with 100% accuracy.

Time required to complete the skill varies with the welding process, joint design and base material.

(Example: A welding procedure is developed for a flat position vee-groove butt joint with a base material of low carbon steel using gas metal arc welding process in one hour or less.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the print, weld standard, appropriate reference material as necessary, national welding code or company specifications.
3. Determine the welding process.
4. Design the appropriate joint.
5. Determine the tentative welding parameters.
6. Determine the weld sequence and placement.
7. Document the tentative welding procedure.
8. Prepare the test joints.
9. Complete the required weld using the tentative welding procedure.
10. Test the weld joint as required by company specifications and/or local or national welding code.
11. Revise the welding parameters as needed.
12. Document the procedure using the company standard welding procedure form or local or national welding code procedure forms.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Welding procedures are developed.

PROCESS

All performance elements for developing welding procedures are critical and must be performed in sequence.

PERFORM WELDER PERFORMANCE DESTRUCTIVE TESTING.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Destructive test preparation and test equipment
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Perform welder performance destructive testing.

PERFORMANCE CRITERIA

Welder performance tests are destructively tested according to company specifications or local and national welding codes.

Skill is performed with 100% accuracy.

Time required to complete the destructive tests will vary with the welding process, joint design, base material, type of test and time allowed for the welder to complete the test.

(Example: Joint preparation, tack welding and welding of the performance test is supervised, and the weld is prepared and destructively root and face bend tested within three hours.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the company quality assurance documentation, weld standard, national welding code or company specifications.
3. Determine the welding process, material type and thickness and test position required for the test.
4. Inspect the work area for safety hazards.
5. Prepare the weld joint.
6. Explain the welding procedure, test requirements, safety considerations and evaluation procedures to the welder.
7. Select and mark the test specimens.
8. Supervise the tack welding of the joint and positioning of the joint.
9. Inspect the root pass.

10. Document the actual welding parameters.
11. Inspect the final weld passes (cover pass) for required reinforcement.
12. Inspect the weld for visual discontinuities.
13. Select and mark the test specimens.
14. Remove and prepare the specimens for testing.
15. Test the weld joint as required by company specifications and local or national welding code.
16. Inspect, measure and document any discontinuity.
17. Record the results of the test on the appropriate documentation.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Welder performance destructive testing is completed.

PROCESS

All performance elements for performing welder performance destructive testing are critical and must be performed in sequence.

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SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Job specifications
Welding procedure or setup instructions
Welding equipment and manuals
Standard tool kit
Company quality assurance documentation
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Troubleshoot welding process problems.

PERFORMANCE CRITERIA

Welding process problems are troubleshooted according to company specifications and requirements.

Skill is performed with 100% accuracy.

Time required to troubleshoot welding process problems will vary with the welding process, joint design, base material, fixturing, and extent of problem.

(Example: Porosity in gas metal arc welding weld is troubleshooted within 20 minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the company quality assurance documentation, welding procedure, weld standard, national welding code or company specifications.
3. Inspect the work area for safety hazards.
4. Gather process and problem information from the operator.
5. Gather process parameter information such as voltage, amperage, wire speed and gas flow.
6. Gather material information such as type, thickness, strength, joint design and condition.
7. Compare gathered information with welding procedures, weld standards or company specifications.
8. Gather technique information such as lead/drag angle, travel speed, oscillation and condition of the joint.

9. Verify actual welding parameters.
10. Inspect the weld passes.
11. Inspect the weld for visual discontinuities.
12. Determine what, if any, additional tests may be necessary.
13. Provide recommendations.
14. Make adjustments per recommendations.
15. Inspect weld after adjustments are completed.
16. Complete the troubleshooting procedure again if necessary.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Troubleshooting of welding process problems is completed.

PROCESS

All performance elements for troubleshooting welding process problems are critical and must be performed in sequence.

MEASURE FILLET AND GROOVE WELDS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Standard part print
Job specifications
Welding procedure or setup instructions
Welding equipment and manuals
Standard tool kit
Measurement instruments
Company quality assurance documentation
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Measure fillet and groove welds.

PERFORMANCE CRITERIA

Fillet and groove welds are measured according to print specifications, company specifications and requirements.

Skill is performed with 100% accuracy.

Time required to measure fillet and groove welds will vary with the welding process, joint design, and size and length of the weld.

(Example: A length of 48 inches of .25-inch (6 mm) fillet weld on .25-inch (6 mm) carbon steel plate is measured within five minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the company quality assurance documentation, weld standard, national welding code or company specifications.
3. Review print and work instructions for required weld size.
4. Inspect the work area for safety hazards.
5. Determine dimensional tolerances.
6. Gather measurement instruments such as fillet gauges and groove weld reinforcement gauge.
7. Select the correct fillet gauge per print or per actual weld.
8. Calibrate or adjust groove weld reinforcement gauge.
9. Measure welds per requirements.
10. Mark or document results.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Measurement of fillet and groove welds is completed.

PROCESS

All performance elements for the measurement of fillet and groove welds are critical and must be performed in sequence.

OPERATE ROBOT WELDING SYSTEM.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Job specifications
Welding procedure or setup instructions
Welding program
Welding equipment and manuals
Standard tool kit
Industrial welding robot
Company robot start-up procedures
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines
Robot Industries Association (RIA) robot safety guidelines
American Welding Society (AWS) robot safety guidelines

WORK TO BE PERFORMED

Operate robot welding system per job specifications.

PERFORMANCE CRITERIA

Robot welding system is operated to make required welds according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to make the required robot welds will vary with the joint design, number, size, and length of the weld.

(Example: A .25-inch (6 mm) fillet weld 18 inches long on carbon steel plate is robot welded within 15 minutes.)

PERFORMANCE ELEMENTS

Note: RIA and AWS robot safety guidelines are available and their practice is recommended in performing this skill.

1. Put on PPE as needed.
2. Review company job specifications and company, local and national welding codes.
3. Review print and welding procedure or setup instructions for program number or program name.
4. Inspect work area for safety hazards.

5. Power-up robot system (robot and peripheral equipment) per company robot start-up and safety procedures.
6. Check work envelope for obstructions and remove obstructions as needed.
7. Calibrate (align, reference, home) robot.
8. Move the robot to the program start position (home, safe position).
9. Load welding program into memory of robot or verify welding program is resident in memory.
10. Load tool center point (TCP) or verify correct TCP is resident in memory.
11. Verify TCP per company procedures.
12. Check welding consumables and verify welding consumables are correct per job specifications and setup instructions.
13. Place part, subassembly or assembly into fixture.
14. Verify all safety interlocks are properly activated.
15. Execute welding program.
16. Use company safety procedures and enter the robot work area to verify weld quality.
17. Adjust welding parameters, torch angle and program geometry, as necessary, per company procedures.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Weld is completed using a robot welding system.

PROCESS

All performance elements for operating the robot welding system are critical and must be performed in sequence.

SET WELDING GUN TOOL DEFINITION/TOOL CENTER POINT (TCP) FOR ROBOT WELDING.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Job specifications
Welding procedure or setup instructions
Welding equipment
Standard tool kit
Industrial welding robot
Tool definition/TCP setting software
Company robot start-up procedures
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines
Robot Industries Association (RIA) robot safety guidelines
American Welding Society (AWS) robot safety guidelines

WORK TO BE PERFORMED

Set tool definition/TCP for robot welding system per job specifications.

PERFORMANCE CRITERIA

Tool definition/TCP robot welding system is set to make required welds according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to set tool definition/TCP will vary with TCP fixturing, software or automated TCP system used.

(Example: TCP using fixturing attached to arm is manually set within 15 minutes.)

PERFORMANCE ELEMENTS

Note: RIA and AWS robot safety guidelines are available and their practice is recommended in performing this skill.

1. Put on PPE as needed.
2. Review the company job specifications and company, local and national welding codes.
3. Review company robot start-up procedures for setting TCP.
4. Inspect work area for safety hazards.

5. Power-up robot system (robot and peripheral equipment such as automated TCP system) per company start-up and safety procedures.
6. Check work envelope for obstructions and remove obstructions as needed.
7. Calibrate (align, reference, home) robot.
8. Move robot to TCP setting location.
9. Use company safety procedures, enter robot work area and attach TCP fixturing or move robot to automated TCP setting position.
10. Load TCP setting software into memory of robot or verify TCP setting software is resident in memory as needed.
11. Adjust contact tip to correct TCP or execute automated TCP setting program.
12. Verify TCP per company procedures.
13. Move robot to TCP setting location or safe location and remove and store all TCP fixturing.
14. Move robot to home position or program start position.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Tool definition/TCP for robot welding system is set per job specifications.

PROCESS

All performance elements for setting the tool definition/TCP for robot welding are critical and must be performed in sequence.

SET UP AND OPERATE COMPUTER NUMERICAL CONTROL (CNC) OXY-FUEL CUTTING (OFC) SYSTEM.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Job specifications
Welding procedure or setup instructions
Standard tool kit
CNC oxy–fuel cutting system
Company start-up procedures
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Set up and operate CNC oxy-fuel cutting equipment per job specifications.

PERFORMANCE CRITERIA

CNC oxy-fuel cutting equipment is set up and operated according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to set up and operate CNC oxy-fuel cutting equipment will vary with the number of cutting torches, complexity of the controller and complexity of the part.

(Example: A CNC oxy-fuel cutting system is operated to cut a 10-inch by 10-inch square from .25-inch (6 mm) thick carbon steel in 15 minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE as needed.
2. Review the company job specifications and company, local and national welding codes.
3. Review work instructions for setting up and operating CNC oxy-fuel cutting system.
4. Inspect the work area for safety hazards.
5. Power up the CNC system per company start-up procedures.
6. Check cutting area for obstructions and remove obstructions as needed.
7. Calibrate (align, reference, home) the CNC oxy-fuel system as needed.
8. Check the torch tips and clean as needed.

9. Load cutting program into memory of controller or verify cutting program is resident in memory.
10. Check oxygen and fuel pressures and adjust as necessary.
11. Place material on cutting table.
12. Verify all safety interlocks are properly activated.
13. Move torch(es) to X0, Y0, Z0 or to start location.
14. Execute cutting program.
15. Verify cut quality.
16. Adjust cutting parameters, torch position and program geometry per company procedures.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

CNC oxy-fuel cutting system is properly set up and operated.

PROCESS

All performance elements for setting up and operating CNC oxy-fuel cutting system are critical and must be performed in sequence.

OPERATE MECHANIZED GAS METAL ARC WELDING (GMAW) SYSTEM.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Job specifications
Welding procedure or setup instructions
Mechanized gas metal arc welding system
Company start-up procedures
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Operate mechanized GMAW system.

PERFORMANCE CRITERIA

Mechanized GMAW system is operated according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to operate mechanized GMAW system varies with the complexity of the part and functions of the mechanized gas metal arc welding system.

(Example: Mechanized GMAW system is operated to weld 24-inch long fillet weld on .25-inch (6 mm) thick carbon steel in 20 minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the company, local or national welding codes.
3. Review welding procedure or setup instructions for operating mechanized gas metal arc welding system.
4. Inspect the work area for safety hazards.
5. Place or attach track or following mechanism to the work surface.
6. Place carriage on track or following mechanism. Adjust rollers or tracking mechanism for smooth motion.
7. Adjust gun angle and height as necessary.
8. Adjust speed per welding procedure or setup instructions.
9. Set welding parameters per welding procedure or setup instructions.
10. Adjust ancillary functions (weave, weave pattern, dwell) as necessary.

11. Turn on welding power supply and wire feeder. Energize output to the mechanized gas metal arc welding system.
12. Start the process welding and carriage travel.
13. Inspect weld to assure conformance with job specifications.
14. Adjust welding parameters, gun position and travel speed as needed.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Mechanized GMAW system is properly operated.

PROCESS

All performance elements for operating mechanized GMAW system are critical and must be performed in sequence.

OPERATE MECHANIZED SUBMERGED ARC WELDING (SAW) SYSTEM.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Job specifications
Welding procedure or setup instructions
Mechanized submerged arc welding system
Company start-up procedures
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Operate mechanized SAW system.

PERFORMANCE CRITERIA

Mechanized SAW system is operated according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to operate mechanized SAW system varies with the complexity of the part and functions of the mechanized submerged arc welding system.

(Example: Mechanized SAW system is operated to weld 24-inch long fillet weld on .50-inch (13 mm) thick carbon steel in 20 minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review company, local and national welding codes.
3. Review welding procedure or setup instructions for operating mechanized submerged arc welding system.
4. Inspect the work area for safety hazards.
5. Place or attach track or following mechanism to the work surface.
6. Place carriage on track or following mechanism. Adjust rollers or tracking mechanism for smooth motion.
7. Adjust gun angle and height as necessary.
8. Adjust speed per welding procedure or setup instructions.
9. Set welding parameters per welding procedure or setup instructions.
10. Adjust ancillary functions (e.g., weave, weave pattern, dwell) as necessary.
11. Check flux supply. Fill hopper or canister as needed.

12. Turn on welding power supply and wire feeder. Energize output to mechanized submerged arc welding system.
13. Start process welding and carriage travel.
14. Remove or reclaim flux.
15. Remove slag.
16. Inspect weld to assure conformance with job specifications.
17. Adjust welding parameters, gun position and travel speed as needed.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

The mechanized SAW system is properly operated.

PROCESS

All performance elements for operating mechanized SAW system are critical and must be performed in sequence.

OPERATE RESISTANCE SPOT (RSW) AND PROJECTION WELDING (PW) SYSTEM.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Job specifications
Welding procedure or setup instructions
Resistance spot and projection welding system
Company start-up procedures
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Operate resistance spot and projection welding system.

PERFORMANCE CRITERIA

Resistance spot and projection welding system is operated according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to operate resistance spot and projection welding system varies with the complexity of the part and functions of the resistance spot and projection welding system.

(Example: Resistance spot and projection welding system is operated to complete 10 spot or projection welds on 14 gauge carbon steel sheet in ten minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review the company, local and national welding codes.
3. Review welding procedure or setup instructions for operating resistance spot and projection welding system.
4. Inspect the work area for safety hazards.
5. Inspect electrodes; dress or replace as needed.
6. Set welding parameters per welding procedure or setup instructions.
7. Adjust air or hydraulic pressure per welding procedure or setup instructions.
8. Check alignment of electrodes; adjust as necessary.

9. Turn on welding power supply or main power to the resistance spot and projection welding system.
10. Gather projection weld parts per part print, welding procedure or setup instructions.
11. Make test weld.
12. Make weld per part print, welding procedure or setup instructions.
13. Inspect weld to assure conformance with job specifications.
14. Adjust welding parameters and electrode position as needed.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

Company, local and national welding codes are followed.

PRODUCT

Resistance spot and projection welding system is properly operated.

PROCESS

All performance elements for operating resistance spot and projection welding system are critical and must be performed in sequence.

OPERATE CAPACITOR DISCHARGE PROJECTION WELDING SYSTEM.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Personal protective equipment (PPE)
Reference material
Standard part print
Job specifications
Welding procedure or setup instructions
Projection welding system
Company start-up procedures
Company, local and national welding codes
Occupational Safety and Health Administration (OSHA) guidelines
Environmental Protection Agency (EPA) guidelines

WORK TO BE PERFORMED

Operate capacitor discharge projection welding system.

PERFORMANCE CRITERIA

Capacitor discharge projection welding system is operated according to standard part print, job specifications and applicable welding codes.

Skill is performed with 100% accuracy.

Time required to operate capacitor discharge projection welding system varies with the complexity of the part and functions of the projection welding system.

(Example: Projection welding system is operated to complete ten .25-inch (6 mm) by 20 Unified National Course (UNC) projection welded studs on 14 gauge carbon steel sheet in ten minutes.)

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Review company, local and national welding codes.
3. Review welding procedure or setup instructions for operating projection welding system.
4. Inspect work area for safety hazards.
5. Inspect projection welding gun chuck; clean or replace as needed.
6. Set welding parameters per welding procedure or setup instructions.
7. Adjust air or hydraulic pressure per welding procedure or setup instructions.
8. Check alignment of projection welding gun foot to the part and projection; adjust as necessary.
9. Turn on welding power supply or main power to projection welding system.

10. Gather projection weld parts per part print, welding procedure or setup instructions.
11. Make test weld.
12. Make weld per part print, welding procedure or setup instructions.
13. Inspect weld to assure conformance with job specifications.
14. Adjust welding parameters and gun position as needed.

PERFORMANCE ASSESSMENT CRITERIA

OSHA and EPA requirements are followed.

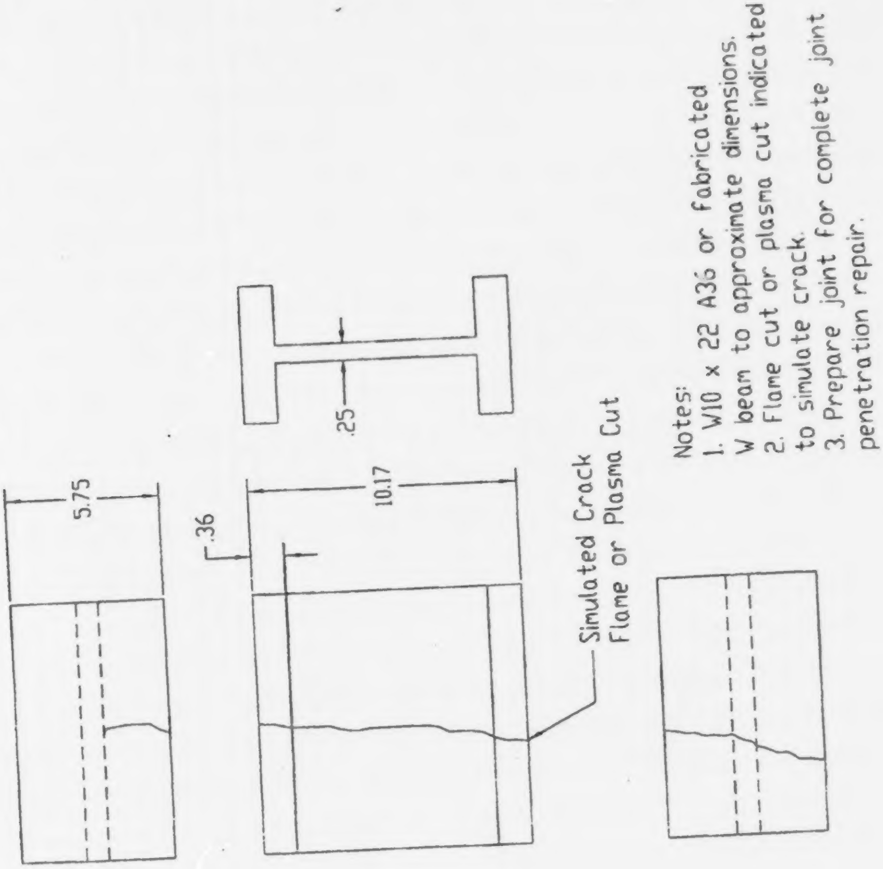
Company, local and national welding codes are followed.

PRODUCT

Projection welding system is properly operated.

PROCESS

All performance elements for operating projection welding system are critical and must be performed in sequence.


5.75
.36
10.17
.25
Simulated Crack
Flame or Plasma Cut

Notes:
1. W10 x 22 A36 or fabricated W beam to approximate dimensions.
2. Flame cut or plasma cut indicated to simulate crack.
3. Prepare joint for complete joint penetration repair.

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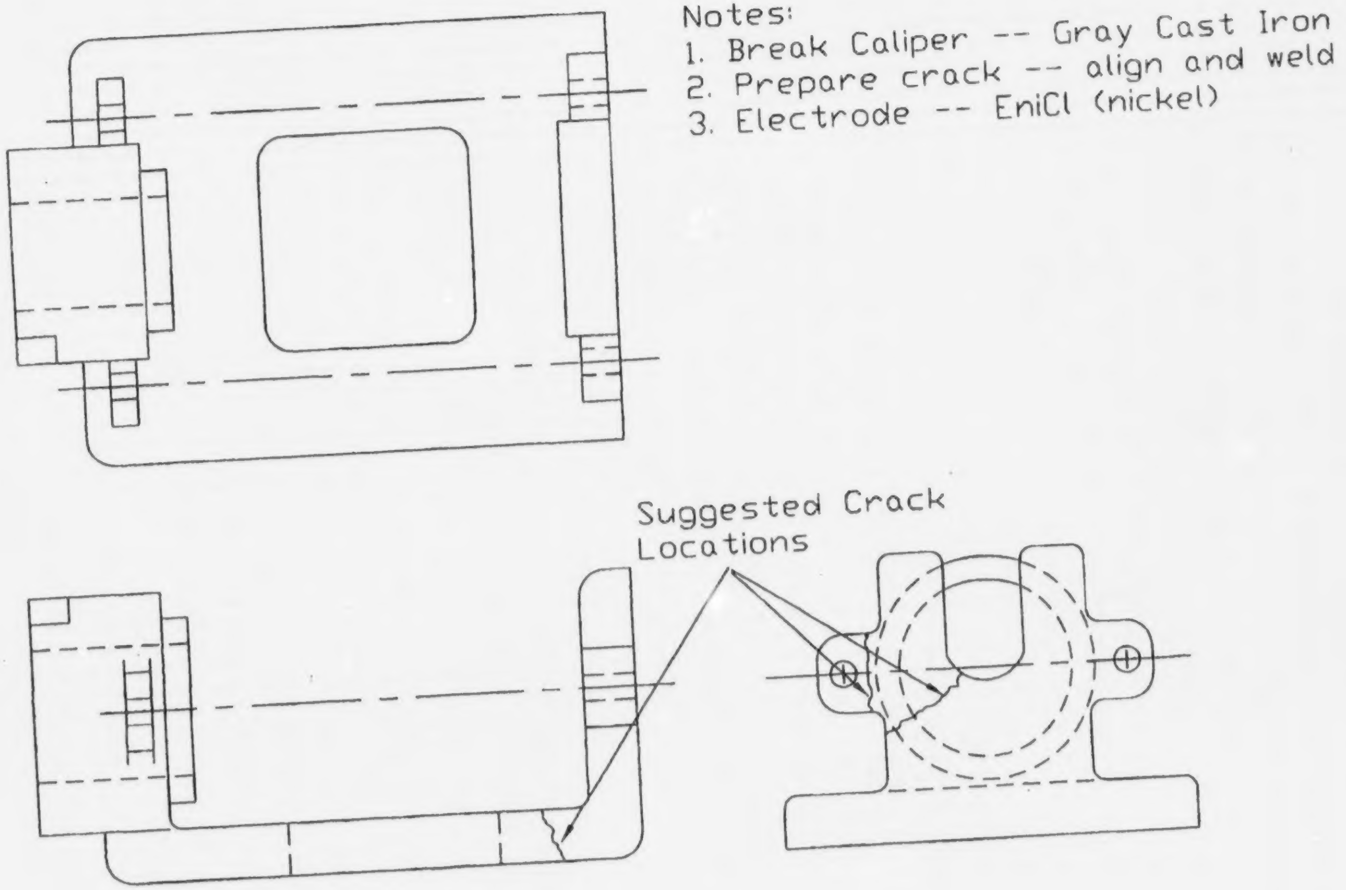
Notes:
1. Break Caliper -- Gray Cast Iron
2. Prepare crack -- align and weld
3. Electrode -- EniCl (nickel)
Suggested Crack
Locations

ACCEPTANCE CRITERIA FOR SUCCESSFUL COMPLETION OF SKILL STANDARD

The acceptance criteria described herein are considered the minimum acceptable for all visually inspected welds. More rigorous criteria may be adopted by an organization using these skill standards.

Visual inspection:

- Each weld shall be divided into approximately 1.00 inch (25 mm) sections along the length.

For successful completion of the skill standard for welds accessible from one side or not requiring complete joint penetration (CJP), the discontinuities shall not exceed:

- 1/8 inch (3 mm) measured in any direction on the surface (free of linear indications);
- 1/32 inch (1 mm) undercut greater than 1/8 inch in length;
- 1/32 inch (1 mm) porosity or 1/4 inch (6 mm) the sum of all porosity not exceeding 1/32 inch (1 mm);
- Weld reinforcement greater than 1/8 inch (3 mm) for greater than 3/8 inch (8 mm) in length;
- Craters below the surface of the base metal;
- Fillets with unequal legs for more than 1/2 inch (13 mm) in length;
- Weld toe-to-toe inconsistency greater than 1/4 inch (6 mm) in length; and
- Weld reinforcement inconsistency greater than 1/4 inch (6 mm) in length.

For successful completion of the skill standard for welds requiring complete joint penetration (CJP) the discontinuities shall not exceed:

- 1/16 inch (1.5 mm) concavity of the root greater than 3/8 inch (8 mm) in length;
- 1/8 inch (3 mm) melt-through of the root greater than 1/4 inch (6 mm) in length; and
- Lack of fusion for greater than 3/8 inch (8 mm) in length.

All measurements of discontinuities shall be made with a standard six (6) inch steel rule graduated in .0156 inch (1/64 inch, 0.4 mm) increments.

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Arc Length	Distance between the end of the electrode and the weld puddle. For GMAW, the arc length varies with short circuit transfer but is fairly consistent with spray transfer.
Backing	Material (steel, carbon, copper) placed against the root of the weld joint to support the weld metal.
Carbon Steel	Alloy of iron, carbon and manganese. For welding, the carbon steel generally will contain less than 0.30% carbon by weight. Carbon steel is manufactured in plate, sheet, pipe and other structural forms.
Crater	Depression at the end of the weld bead. If excessive, a crack will form. Pausing at the end of the weld will generally fill the crater.
Fillet Weld	Type of weld performed when joining two surfaces at an angle. The weld is approximately triangular in shape.
Fillet Gage	Measuring device used to determine the size of the leg of a fillet weld.
Flow Meter	Gas measurement device used to display flow and meter shielding gas to welding guns and torches. Flow meters are capable of metering different gases on the same meter. The graduations will be different for each gas. Caution should be used when setting and reading the meter so that the correct gas is metered.
Groove Weld	Weld made in a groove on one or both surfaces to be joined.
Heat Affected Zone (HAZ)	Area next to the weld bead where there is metallurgical change. Usually in low carbon steel (A36), little damage is found in the HAZ, *but* overheating or holding the steel at an elevated temperature for an extended length of time will cause grain growth and the possibility of cracking.

Personal Protective Equipment (PPE)	Equipment designed to protect welders and supervisory personnel from injury. The equipment should be selected based upon the welding processes and procedures employed on the job. Company safety guidelines should be followed and supervisors should be contacted if there is doubt about the appropriateness of the equipment. PPE commonly includes hearing protectors, safety glasses with side shields or goggles; gloves (leather or heat resistant), leather aprons, flame resistant jacket or heat and/or flame resistant clothing; boots (heavy leather or heavy leather with toe and/or metatarsal protection), hat, head protection, and/or hard hat; and in some cases respirators, air-filter masks or air pack.
Porosity	Gas pockets formed in the surface of the weld or subsurface. The gas pockets are a result of oil, paint, rust or other foreign material on the metal. The gas passes through the weld while it is molten but the gas is trapped as the metal solidifies. Elements like silicon and aluminum tend to remove some of the trapped gas. Some movement (weave or oscillation) of the gun will also help remove gases. *Remember* for solid wire mig, there is *no* flux that will aid in the removal of foreign material from the base metal.
Preheating	Heat applied to the work (part) prior to welding. The purpose is to slow the cooling rate to prevent embitterment and cracking. Generally only medium carbon, high carbon, alloy steels and cast iron should be preheated. Low carbon steel should be heated only if it is below about 60°F.
Procedure/Welding Procedure Specification (WPS)	Written document used as a standard for welding a part or product. The WPS provides consistency in the welding process.
Reinforcement	"Buildup" above the flush surface of a butt joint. Generally 0.125 inches is the maximum reinforcement permissible on a weld joint.
Shielding Gas	Inert gas or inert and active gas mixtures used to shield the molten puddle from the air. Generally 75% argon/25% CO_2 is used for low carbon steel short circuit transfer. As the argon content increases, the transition voltage to spray transfer decreases. For spray transfer, 90% argon/10% CO_2 is commonly used.
Shrinkage	Volume change as a weld cools. If the part or structure is rigidly held, the shrinkage force of the weld will cause the weld or the base metal to crack. Multiple welds will reduce the shrinkage force at the center of the weld, reducing centerline cracking.

Short Circuit Transfer	Transfer requiring the wire to touch the puddle or base metal. The transfer mode is how the wire electrode crosses the arc and is deposited into the molten puddle. The touching causes a short circuit that increases the amperage and melts the wire. The shorting also causes the amperage to go infinite (in theory) which explodes some of the puddle in the form of spatter onto the base metal. Short circuit is usually used for thinner carbon steels. Caution should be used when welding thicker steel with short circuit transfer to make sure enough energy is available for proper penetration. Short circuit transfer GMAW welds are usually cold.
Spray Transfer	Transfer requiring higher voltage to cause the wire electrode to melt *before* it touches the base metal. Small droplets of metal are formed (similar to paint spray). The spray arc tends to wander if the wire feed rate is not high enough. Spray transfer is a high energy transfer mode that shows good penetration. On thin metals, the travel speed (speed of the welder across the weld joint) needs to be increased. Heat input into the metal is calculated by the following equation: ***volts x amps x 60/travel speed*** (inches per minute). Therefore, increasing the travel speed lowers the total heat input and reduces the chances of melt through.
Stainless Steel	Alloy of steel that is practically immune to rusting and ordinary corrosion. The most common stainless steel welded is austenitic. Austenitic stainless steel is an alloy of iron, carbon, manganese, chromium and nickel. The additions of chromium and nickel cause the steel to remain as austenite (microstructure). The chromium provides great corrosion protection from most acids and bases. The nickel helps to stabilize the grain structure and provide ductility and toughness. Austenitic stainless steel is very weldable but it will tend to warp. Using lower amperages will reduce the size of the weld. If corrosion resistance is a concern, use low carbon stainless steel.
Stickout	Distance the wire extends from the contact tip. For most hard wire mig welding the wire stickout or extension should be as short as possible. Longer stickout increases the resistance in the wire which causes the arc to be eratic.
Test Positions	Letters used to designate the type and position of welds for performance qualification tests: 1 = flat F = fillet 2 = horizontal G = groove 3 = vertical 4 = overhead 5 = pipe or square tube weld fixed horizontal axis 6 = pipe or square tube fixed 45° axis

APPENDIX E

WELDING CLUSTER TOOL KIT

Standard

- Measuring tape – English/metric
- Soap stone/chalk
- Wire brush
- Square
- Straight edge
- Chipping hammer
- 2-5 pound hammer
- Pliers slip jaw/chain nose
- Oxy-fuel tip cleaner
- Striker
- Scribe
- Diagonal cutting pliers

Optional

- Framing square
- Industrial protractor
- Chalk line
- Divider
- Combination square with centering, angle and square attachments
- C-clamps
- Vise grip c-clamps
- Adjustable wrench 0"-4"
- Center punch
- Metal chisel
- Caliper 0"-6"
- File
- Hexagon wrench set
- Socket wrench set
- Temperature indicating crayons
- Fillet gauge set
- Groove weld reinforcement gauge
- Pocket calculator
- Inside diameter pipe alignment gauges

Academic Skills	Skills (and related knowledge) contained in the subject areas and disciplines addressed in most national and state educational standards, including English, mathematics, science, etc.
Assessment	A process of measuring performance against a set of standards through examinations, practical tests, performance observations and/or the completion of work portfolios.
Content Standard	A specification of what someone should know or be able to do to successfully perform a work activity or demonstrate a skill.
Critical Work Functions	Distinct and economically meaningful sets of work activities critical to a work process or business unit which are performed to achieve a given work objective with work outputs that have definable performance criteria. A critical work function has three major components: • **Conditions of Performance:** The information, tools, equipment and other resources provided to a person for a work performance. • **Work to Be Performed:** A description of the work to be performed. • **Performance Criteria:** The criteria used to determine the required level of performance. These criteria could include product characteristics (e.g., accuracy levels, appearance, etc.), process or procedure requirements (e.g., safety, standard professional procedures, etc.) and time and resource requirements. The IOSSCC requires that these performance criteria be further specified by more detailed individual performance elements and assessment criteria.
Credentialing	The provision of a certificate or award to an individual indicating the attainment of a designated set of knowledge and skills and/or the demonstration of a set of critical work functions for an industry/occupational area.
Illinois Occupational Skill Standards and Credentialing Council (IOSSCC)	Legislated body representing business and industry which establishes skill standards criteria, endorses final products approved by the industry subcouncil and standards development committee and assists in marketing and dissemination of occupational skill standards.
Industry	Type of economic activity, or product or service produced or provided in a physical location (employer establishment). They are usually defined in terms of the Standard Industrial Classification (SIC) system.

Industry Subcouncil	Representatives from business/industry and education responsible for identifying and prioritizing occupations for which occupational performance skill standards are adapted, adopted or developed. They establish standards development committees and submit developed skill standards to the IOSSCC for endorsement. They design marketing plans and promote endorsed skill standards across the industry.
Knowledge	Understanding the facts, principles, processes, methods and techniques related to a particular subject area, occupation or industry.
Occupation	A group or cluster of jobs, sharing a common set of work functions and tasks, work products/services and/or worker characteristics. Occupations are generally defined in terms of a national classification system including the Standard Occupational Classification (SOC), Occupational Employment Statistics (OES) and the Dictionary of Occupational Titles (DOT).
Occupational Cluster	Grouping of occupations from one or more industries that share common skill requirements.
Occupational Skill Standards	Specifications of content and performance standards for critical work functions or activities and the underlying academic, workplace and occupational knowledge and skills needed for an occupation or an industry/occupational area.
Occupational Skills	Technical skills (and related knowledge) required to perform the work functions and activities within an occupation.
Performance Standard	A specification of the criteria used to judge the successful performance of a work activity or the demonstration of a skill.
Product Developer	Individual contracted to work with the standard development committee, state liaison, industry subcouncil and IOSSCC for the adaptation, adoption or development of skill standards content.
Reliability	The degree of precision or error in an assessment system so repeated measurements yield consistent results.

Skill	A combination of perceptual, motor, manual, intellectual and social abilities used to perform a work activity.
Skill Standard	Statement that specifies the knowledge and competencies required to perform successfully in the workplace.
Standards Development Committee	Incumbent workers, supervisors and human resource persons within the industry who perform the skills for which standards are being developed. Secondary and postsecondary educators are also represented on the committee. They identify and verify occupational skill standards and assessment mechanisms and recommend products to the industry subcouncil for approval.
State Liaison	Individual responsible for communicating information among all parties (e.g., IOSSCC, subcouncil, standard development committee, product developer, project director, etc.) in skill standard development.
Third-Party Assessment	An assessment system in which an industry-designated organization (other than the training provider) administers and controls the assessment process to ensure objectivity and consistency. The training provider could be directly involved in the assessment process under the direction and control of a third-party organization.
Validity	The degree of correspondence between performance in the assessment system and job performance.
Workplace Skills	The generic skills essential to seeking, obtaining, keeping and advancing in any job. These skills are related to the performance of critical work functions across a wide variety of industries and occupations including problem solving, leadership, teamwork, etc.

APPENDIX G

ILLINOIS OCCUPATIONAL SKILL STANDARDS AND CREDENTIALING COUNCIL

Margaret Blackshere	AFL-CIO
Skip Douglas	Lucent Technologies
Judith Hale	Hale Associates
Terry Hoyland	Caterpillar University Caterpillar, Inc.
Michael O'Neill	Chicago Building Trades Council
Janet Payne	United Samaritans Medical Center
Gene Rupnik	Hospitality Industry
Jim Schultz	Illinois Retail Merchants Association Walgreen Company

Dale Adamson	United Township Area Career Center East Moline, IL
Bruce Braker	President Tooling and Manufacturing Association
Blouke Carus	President Carus Corporation
Frank Cavarretta	Subdistrict Director United Steelworkers of America
Gerson Ecker	Ecker-Erhardt
Ken Knott	Business Agent District 9 Machinist
Steven Kopinski, Chair	General Manager Abrasive-Form, Inc.
George Marshall	Hoffer Plastics
Bob Shaw	Heartland Community College
Sam Spiear	Manager, Employee Relations/Employee Development John Deere Harvester
Marvin Wortell	Chairman Triton Industries
Ronald Engstrom	State Liaison Illinois State Board of Education

APPENDIX I

WELDING CLUSTER STANDARDS DEVELOPMENT COMMITTEE

Ken Carlson	Weld Instructor John Deere Harvester Works – East Moline, IL
Terri Carpenter	Air Products – Davenport, IA
Steve Chestney	Instructor Illinois State University – Hudson, IL
Stan Egli	Quality Control Engineer Komatsu Mining Systems – Peoria, IL
Lewis Garrison	Instructor Local 99 – Bloomington, IL
Walt Harper	Training Instructor Federal Correctional Institute – Pekin, IL
Tom Heppner	Caterpillar, Inc. – East Peoria, IL
Mark Kerley	CNH – Goodfield, IL
Dan McCarty	Rock Valley Community College – Rockford, IL
Mike Merriman	Rock Valley Community College – Mendota, IL
Hank Miller	Welding Instructor Vermillion Occupational Technical Educational Center Danville, IL
Jerry Purdue	Welding Process Engineer Parsons Company, Inc. – Roanoke, IL
Terry Swain	Weld Instructor John Deer Harvester Works – East Moline, IL
Rick Polanin, Ph.D	Product Developer Illinois Central College
Ron Engstrom	State Liaison Illinois State Board of Education

APPENDIX J

WORKPLACE SKILLS

A. Developing an Employment Plan	1. Match interests to employment area.
	2. Match aptitudes to employment area.
	3. Identify short-term work goals.
	4. Match attitudes to job area.
	5. Match personality type to job area.
	6. Match physical capabilities to job area.
	7. Identify career information from counseling sources.
	8. Demonstrate a drug-free status.
B. Seeking and Applying for Employment Opportunities	1. Locate employment opportunities.
	2. Identify job requirements.
	3. Locate resources for finding employment.
	4. Prepare a resume.
	5. Prepare for job interview.
	6. Identify conditions for employment.
	7. Evaluate job opportunities.
	8. Identify steps in applying for a job.
	9. Write job application letter.
	10. Write interview follow-up letter.
	11. Complete job application form.
	12. Identify attire for job interview.
C. Accepting Employment	1. Apply for social security number.
	2. Complete state and federal tax forms.
	3. Accept or reject employment offer.
	4. Complete employee's Withholding Allowance Certificate Form W-4.
D. Communicating on the Job	1. Communicate orally with others.
	2. Use telephone etiquette.
	3. Interpret the use of body language.
	4. Prepare written communication.
	5. Follow written directions.
	6. Ask questions about tasks.
E. Interpreting the Economics of Work	1. Identify the role of business in the economic system.
	2. Describe responsibilities of employee.
	3. Describe responsibilities of employer or management.
	4. Investigate opportunities and options for business ownership.
	5. Assess entrepreneurship skills.
F. Maintaining Professionalism	1. Participate in employment orientation.
	2. Assess business image, products and/or services.
	3. Identify positive behavior.
	4. Identify company dress and appearance standards.
	5. Participate in meetings in a positive and constructive manner.
	6. Identify work-related terminology.
	7. Identify how to treat people with respect.

G. Adapting to and Coping with Change

1. Identify elements of job transition.
2. Formulate a transition plan.
3. Identify implementation procedures for a transition plan.
4. Evaluate the transition plan.
5. Exhibit ability to handle stress.
6. Recognize need to change or quit a job.
7. Write a letter of resignation.

H. Solving Problems and Critical Thinking

1. Identify the problem.
2. Clarify purposes and goals.
3. Identify solutions to a problem and their impact.
4. Employ reasoning skills.
5. Evaluate options.
6. Set priorities.
7. Select and implement a solution to a problem.
8. Evaluate results of implemented option.
9. Organize workloads.
10. Assess employer and employee responsibility in solving a problem.

I. Maintaining a Safe and Healthy Work Environment

1. Identify safety and health rules/procedures.
2. Demonstrate the knowledge of equipment in the workplace.
3. Identify conservation and environmental practices and policies.
4. Act during emergencies.
5. Maintain work area.
6. Identify hazardous substances in the workplace.

J. Demonstrating Work Ethics and Behavior

1. Identify established rules, regulations and policies.
2. Practice cost effectiveness.
3. Practice time management.
4. Assume responsibility for decisions and actions.
5. Exhibit pride.
6. Display initiative.
7. Display assertiveness.
8. Demonstrate a willingness to learn.
9. Identify the value of maintaining regular attendance.
10. Apply ethical reasoning.

K. Demonstrating Technological Literacy

1. Demonstrate basic keyboarding skills.
2. Demonstrate basic knowledge of computing.
3. Recognize impact of technological changes on tasks and people.

L. Maintaining Interpersonal Relationships

1. Value individual diversity.
2. Respond to praise or criticism.
3. Provide constructive praise or criticism.
4. Channel and control emotional reactions.
5. Resolve conflicts.
6. Display a positive attitude.
7. Identify and react to sexual intimidation/harassment.

M. Demonstrating Teamwork

1. Identify style of leadership used in teamwork.
2. Match team member skills and group activity.
3. Work with team members.
4. Complete a team task.
5. Evaluate outcomes.

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